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Improving Operations towards ISO/IEC 20000 Certification for A Cloud SaaS Provider

On the example of Capacity Management process and Process manager roles

Efecte Finland Oy

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Now, as this long but rewarding process of making this thesis is soon over, I would like to thank all of you that have helped me during this process. This study would not have been possible without the support and cooperation provided by Efecte Finland Oy. First of all, I would like to give specials thanks to Mr. Timo Hyvönen, Vice-President of Services, for supporting and guiding me, and for allocating his precious time for this study. Also, I would like to thank Ms. Milla Kuosmanen, Senior Advisor, for sparring and guiding me through all phases of the study. Altogether, I want to thank Efecte as a company, for providing me a supportive environment and a change to freely develop solutions to real challenges.

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This study focuses on building a proposal for improving the case company's operations towards the ISO/IEC 20000 standard, by improving the Capacity Management process, and implementing the process manager roles.

The case company is preparing to certificate its Support and Operations units with the ISO/IEC 20000 standard and is improving its processes and documentation towards the standard. Since the capacity management process plays a significant role in reaching service level targets, the process was chosen as one development area. The other selected development area was the implementation of the process manager roles. These roles are needed for proactively developing the case company's processes towards the ISO/IEC 20000 standard.

The study was conducted in seven stages using the R&D research approach developed by Industrial Management, Metropolia. The study is based on a structured research process that, first, investigates the challenges of the current state, then seeks important inputs from literature and best practice, and after that produces a proposal in close cooperation with the company stakeholders. The company stakeholders were involved in all stages of the study, through multiple interviews, workshops and discussions.

The study generated proposals for the both development areas. The capacity management proposal consists of a process description for gathering capacity requirements, a tool for translating them into technical specifications and a work instruction process for the cloud team, and next steps for implementing the proposal. For the other development area, actions were carried out to implement the process manager roles. Additionally, role definitions and a continuous support plan were created.

After improving the capacity management process, the case company will benefit by getting a process for sizing new tenants in the cloud environment based on customer requirements. This will allow to equip its customer tenants with proper capacity, to reach service level targets and improve customer satisfaction. The process manager roles help the case company to further develop its service management processes and streamline its operations overall, after clarifying the roles, responsibilities, and expectations.

Keywords	ISO/IEC 20000, ITIL, Capacity Management, Roles

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List of Abbreviations

ISO	International Organization for Standardization
IEC	International Electrotechnical Commission
ITSM	IT Service Management
ESM	Efecte Service Management
ITIL	Information Technology Infrastructure Library
SACM	Software Asset and Configuration Management
CMDB	Configuration Management Database
CI	Configuration item
CMIS	Configuration Management Information System
SMS	Service Management System.

1 Introduction

This study examines the ISO 20000 Certification and Development project and proposes a plan and actions to improve the operations to bring the case company closer to the ISO/IEC 20000 certification. The case company is a Nordic cloud SaaS provider's that aims at ISO/IEC 20000 certification. Due to new business requirements and contractual obligations set by a new strategy, the case company Efecte Oyj (hereinafter Efecte) has decided to develop a new business model and aim at growth of its operations.

In the context of Efecte, the ISO 20000 Certification and Development project – including all development efforts – strives to streamline the operational processes related to production of the services. The relatively new business model of providing services with the SaaS principle sets requirements for various aspects related to all Service lifecycle phases related to in ITIL. The areas improved in this study are the Capacity Management process and the process manager roles.

1.1 Business Context

The case company is a cloud SaaS provider founded in 1998 with operations in northern Europe. The company offers Digitalized and Automated Enterprise Services, related mainly to IT Service Management, Self-Service and Identity Management solutions. It has about 80 employees, and the company is growing rapidly, with the goal of being Number 1 in its field in Europe. The case company is the market leader in Finland with 300 customers, and the largest vendor in the Nordics measured by revenue. It has operations and offices in 4 countries: Finland, Sweden, Denmark and Germany. The headquarters are located in Espoo, Finland. The case company's customers are mainly medium to large sized Nordic companies from the private and public sectors. Examples of the customers are Stena, Metso, Danske Bank, Orion, Svenska Kyrkan, Valio, Fazer, VR and City of Helsinki.

The case company's strategy led to a new business model in 2013. The following visualization (Figure 1) explains the context of the ISO 20000 Certification and Development project.

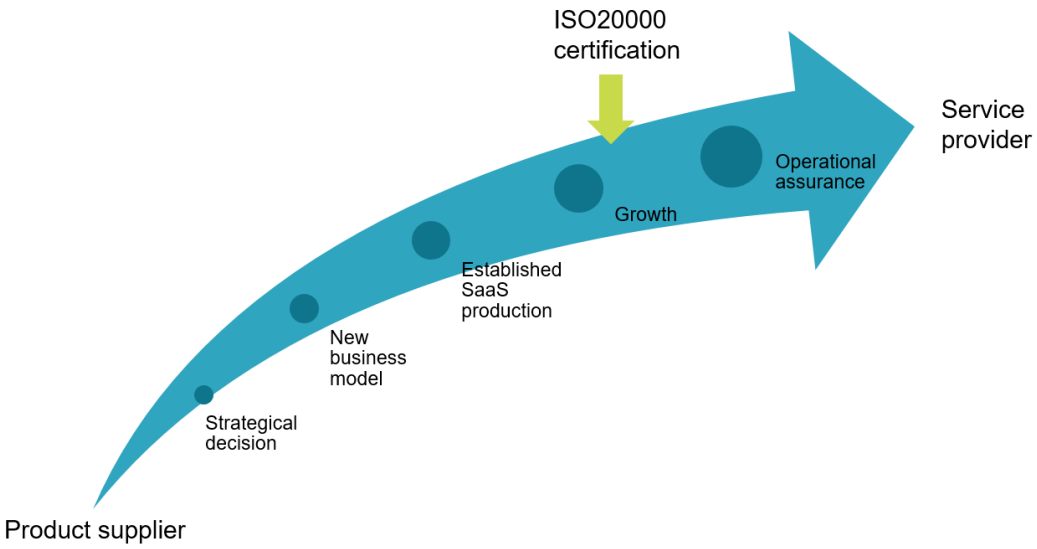


Figure 1. The case company's transition from Product supplier to Service provider.

As seen in Figure 1 above, the case company decided to change its business model from selling product licenses to providing services. After designing the new business model, SaaS (Software as a Service) production was established. This implies that instead of selling a license, the customer subscribes for a service, and pays a monthly subscription fee. Also, the company started to provide its software from cloud instances. The previous way of operating was that the software was installed as an on-premise installation for the customer. With on-premise installations, the customer was responsible for maintaining the infrastructure. With the new cloud operation model, the case company takes care of the technical maintenance.

1.2 Business Challenge, Objective and Outcome

After establishing SaaS production, the case company experienced rapid growth in operations. At the time of writing (autumn 2017), the growth is continuing, which results in new requirements for the operations. The consistency, continuity, availability and many other aspects of the production had been subject for new requirements, including the new contractual obligations. In 2016, the case company's management responsible for the services recognized the need for further developing the operations. The ISO/IEC 20000 certification was set as a goal, and a development project was started. The development project and the certification's scope was set to cover the Support & Operations unit, which operates under the PSO department.

By the time of writing (autumn 2017), a pre-evaluation audit was done, which recognized several challenges with implementation of the ITSM processes in the company. The current state of the processes does not match completely with the ISO 20000 requirements. The reason for developing the operations and acquiring the certification is related to several benefits achieved from improved the processes and having ISO 20000 certified operations. As a result, the operations should be more scalable and profitable, and the management of capacity, availability and continuity are guaranteed to a certain degree. Also, tracking of costs related to the production of services is supposed to be improved. In addition to these benefits, operations certified with ISO 20000 are supposed to be more trustworthy and functional for the customers, leading potentially to higher customer satisfaction.

Accordingly, the business challenge is related to the development of the capacity management process and the process manager roles to match with the growing demand and requirements.

The objective of the study is to create a plan, develop and implement the capacity management processes and to improve the process manager roles based on the needs defined by the ongoing ISO 20000 Certification and Development project in the case company.

The outcome of the study is a plan, developed processes and documentation that comply with the requirements set by ISO 20000. Also, the study provides a summary of the ISO 20000 Certification and Development project in the case company describing the efforts done in the project on a timeline.

1.3 Thesis Outline

The areas of research and analysis in this study are limited to the scope of the case company's ISO 20000 Certification and Development project of the Operations department (Support & Operations) of Efecte Finland Oy. The study is conducted by using qualitative research methods and is based on the analysis of internal data, documents, discussions, workshops and internal and external audits. All the actions proposed and executed towards achieving the certification are documented and presented either in the text of the thesis or in its appendices.

This study is written in 7 sections. Section 1 is the introduction. Section 2 overviews the research design, method and material used in the study. Section 3 provides an overview of the case company's current state regarding the certification of the operations and analysis of selected development areas. Section 4 provides information on best practice and existing knowledge related to capability management and manager roles in this process from literature and available published sources. Section 5 presents the proposals for the selected development areas and suggests next steps for implementing the proposal. Section 6 contains validation of the proposals and presents further developments to the proposals. Finally, section 7 summarizes the study, provides next steps, and evaluates the study.

2 Method and Material

This section describes the research design, as well as methods and data used in this study. The section starts with a description of the research design, after which the research plan is presented, with the project schedule. Finally, data collection and analysis methods are described.

2.1 Research Design

This study is done in 5 stages shown in the research design diagram in Figure 2 below. As shown in Figure 2, the study starts with defining the objective, the business challenge and outcomes of the study.

In the second stage, the current state analysis (CSA) is done. It provides an overview of the case company's current state regarding the ISO 20000 Certification and Development project and current processes in general. The current state analysis is conducted based on interviews and pre-evaluation results provided by Inspecta. The results from CSA point to the areas to be developed in the proposal stage. The selected development areas revealed in CSA also provide a focus for selecting best practice and literature in the next stage, literature review.

In the third stage, best practice and literature related to the development areas are selected and scrutinized. The goal for this stage is to identify applicable knowledge and best practice and therefore to allow the proposals to be built based on relevant knowledge. The outcome of this stage is the conceptual framework, that shows the key elements of knowledge and best practice needed for building the proposals.

Taken together, the current state analysis and the existing knowledge form a basis for building the proposals in stage four. The proposal building section includes a plan for development actions, proposals for improving the capacity management process and the proposal for improving the implementation of the process manager roles. Also, recommendations for next steps are presented in this stage.

Figure 2 below shows the stages in the research design of this study.

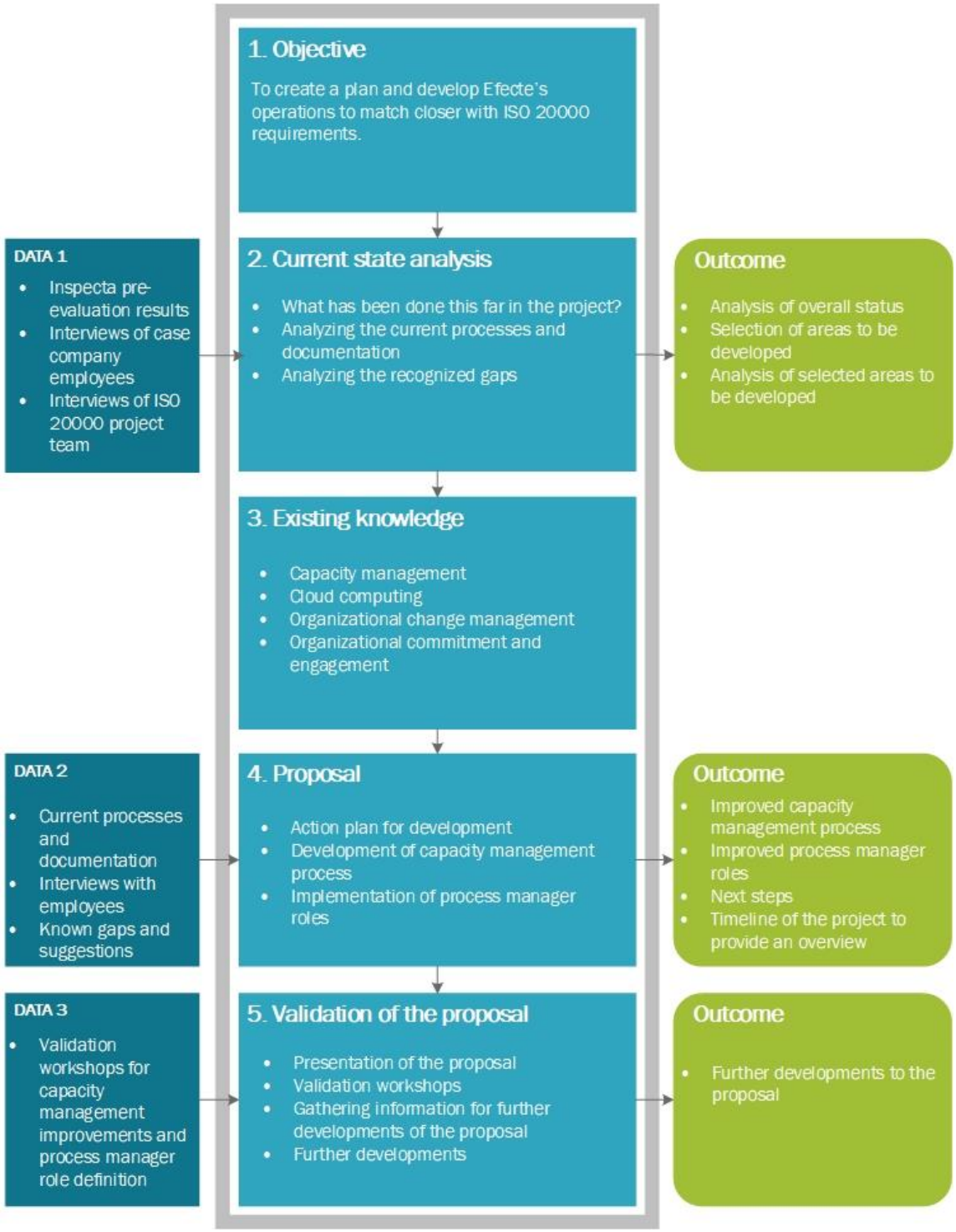


Figure 2. Research design of the study.

In the final stage 5, the proposals are presented and validated through the validation workshops for both development areas. Suggestions for further developments of the proposals are gathered, and final changes are made. The final outcome of this study is the proposal equipped with the further developments.

2.2 Project Plan

This study is conducted simultaneously with the ISO 20000 Certification and Development project in the case company. The schedule depends on the previously mentioned project, since the objective is to develop and implement processes that does currently not match with the requirements. In addition to the pre-evaluation audit, there are two actual audits, which of the former provides a gap-analysis. The latter is the actual audit, that judges whether the case company gets the certification, or not. The project plan is designed to allocate as much work as possible for the proposal building between the two audits. The first audit provides additional information to the current state and guides the study.

A detailed project plan of this study project is provided in Appendix 1. The ISO 20000 Certification and Development project covers all aspects and actions required to achieve the certification.

The ISO 20000 Certification and Development project's general schedule is provided in Appendix 2.

2.3 Data Collection and Analysis

The data was collected in three data collection rounds. This study bases its data collection, first, on gathering data for conducting CSA; second, on collecting the inputs from key persons for building the proposal, and third, on holding the validation sessions coupled with the thesis presentations in the case company.

In the CSA stage, Data 1 is collected from multiple sources, including interviews of key persons, workshops, internal documents and audit results to be able to identify challenges in the current operations. The interviews and workshops made significant sources of data collection. Details of data collected in interviews, workshops and discussions are presented below.

Table 2. Details of interviews, workshops and discussions, in Data 1.

	Participants / role	Data type	Topic, description	Date, length	Documented as
	Data 1, for the Current state analysis (Section 3)				
1	Timo Hyvönen: Efecte V.P. of Services.	Telephone interview	Interview on the pre-evaluation results provided by Inspecta. Gaps and challenges and next steps.	Sep 2017, 30 min	Field notes
2	Milla Kuosmanen: ISO20000 Project manager	Telephone interview	Interview regarding the current state of the project. Gaps and challenges, next steps.	Sep 2017, 30 min	Field notes
3	Päivi Hirki: Director, Support & Operations	Face-to-face interview	Interview regarding the challenges related to the implementation of the new processes.	Oct 2017, 30 min	Field notes
4	Cloud team	Workshop	Workshop (1) for analyzing the capacity management activities and identifying challenges.	Dec 11 2017, 1,5h	Workshop memo
5	Cloud team	Workshop	Workshop (2) for further discussion on identified challenges and finding solutions to the challenges.	Dec 21 2017, 2h	Workshop memo

As seen from Table 2, the first round of collecting Data 1 was conducted for the current state analysis. It gathered the key person's views of the case company's current state regarding the operations and its processes. The pre-evaluation results were reflected and compared to the interviewees' own views of the current state. The input from Data 1 was used to build an overview of the current project state, including the state of the processes and development work related to them.

In addition, in Data 1 collection the documents were used as data for the study. Among the internal documents, the pre-evaluation report provided by Inspecta was utilized along with the current process documentation, in order to establish a general understanding of the case company's processes and process documentation. Internal documents used as Data 1 are shown in Table 3 below.

Table 3. Internal documents used in the current state analysis, Data 1.

	Name of the document	Pages / Documents	Description
1	Pre-evaluation report	12 pages	Report of the initial audit performed by Inspecta. The report briefly presents the main strengths and weaknesses of the current state.
2	Current process documentation (several documents)	~ 100 documents	All process documentation available, including the process descriptions, process policies, plans, presentations etc.)
3	IT-ERP	16 pages	Process maps, CIs and their relations described visually.

Next, Data 2 was gathered for the second data collection round that aimed at building the proposal. Details of Data 2 collection are shown in Table 4 below.

Table 4. Details of interviews, workshops and discussions, in Data 2.

	Participants / role	Data type	Topic, description	Date, length	Documented as
	Data 2, for Proposal building (Section 7)				
1	-Juha Huuhka: Senior software developer -Teemu Lyytinen: Director of PSO	Discussion	Gathering input for the capacity planner tool. Adjusting proposed scoring values and planning new parameters. Planning capacity information flow from project phase to production.	Oct 2017, 1h	Field notes
2	- Milla Kuosmanen: ISO20000 Project manager	Workshop	Process manager role implementation workshop	Nov 2017, 1,5h	Field notes
3	- Milla Kuosmanen: ISO20000 Project manager -Problem manager	Briefing session	Process manager briefing session 1	Dec 2017, 45 min	Field notes
4	- Milla Kuosmanen: ISO20000 Project manager -Service request manager	Briefing session	Process manager briefing session 2	Dec 2017, 45 min	Field notes
5	- Milla Kuosmanen:	Briefing session	Process manager briefing session 3	Dec 2017, 45 min	Field notes

	ISO20000 Project manager -Configuration manager				
6	-Problem manager	Interview	Process manager input interview 1	Dec 2017, 20 min	Field notes
7	-Service request manager	Interview	Process manager input interview 2	Dec 2017, 20 min	Field notes
8	-Configuration manager	Interview	Process manager input interview 3	Dec 2017, 20 min	Field notes

As shown in Table 4, Data 2 was collected to gather suggestions from the project's key persons for building the proposal. The data included multiple workshops with key stakeholders, and briefing sessions with the process managers. Also, as a main topic of the interviews were the next steps required for achieving the certification.

In addition, the following internal documents shown in Table 5 below were also used in the proposal building stage.

Table 5. Internal documents used in the proposal building stage, Data 2.

	Name of the document	**Pages / Documents**	**Description**
1	Capacity management process description	13	The current process description for the capacity management process.
2	Capacity plan	11	The current capacity plan.
3	ESM Advanced training	67 pages	Presentation for advanced admin training. The presentation includes factors that affect ESM capacity and capacity requirements for ESM.

As seen from Table 5, the existing capacity management documentation was used for the proposal building stage. The ESM Advanced training material was also used for gaining understanding on which factors should be considered while planning capacity for the ESM application.

Finally, in Data 3 collection round, the data used for the third collection round is shown below in Table 6 below.

Table 6. Details of interviews, workshops and discussions, in Data 3.

	Participants / role	Data type	Topic, description	Date, length	Documented as
	Data 3, from Validation (Section 8)				
14	-Timo Hyvönen: Efecte V.P. of Services. - Milla Kuosmanen: ISO20000 Project manager	Validation workshop / final presentation	Presentation, evaluation and validation of the process manager role definitions and continuous support plan. Further developments to the proposal.	Jan 16 2018, 1h	Changes directly to the proposal.
15	-Päivi Hirki: Director of Support -Stephan Rühlmann	Validation workshop / final presentation	Presentation, evaluation and validation of the capacity management proposal. Further developments. Presentation to next steps for implementing the proposal.	Jan 19 2018, 2h	Workshop memo

As seen from Table 6, Data 3 was collected for the validation of the proposal in two validation workshops. The data was used for making further developments to the proposals.

Summing up, in this study the workshops and interviews made the primary method of data collection. Most of the workshops and interviews were conducted as face-to-face meetings in the case company's premises. Some of the interviews were conducted by using telephone/skype. Field notes were taken to gather the data from the interviews (see Appendices 3, 6 and 13). The interview questions were created in advance and can be seen from the interview field notes.

Part of the data analysis was done based on the reports produced by the audits made by Inspecta. The reports were analyzed by the author, and they were used along with other data as base for planning the workshops and interview questions. The findings from the current state are discussed in Section 3 below.

3 Current State Analysis of the ISO 20000 Certification and Development Project

This section discusses the current state analysis in the context of the ISO 20000 Certification and Development project in the case company. First, an overview of the current state analysis stage is provided, after which the background of the processes in general is presented. Next, audit findings of Inspecta's audit are discussed, including strengths of the current state. Internal findings are discussed after that, and finally findings related to the process manager roles are presented. The CSA ends with a summary, in which also the development areas for this study are presented.

3.1 Overview of CSA Stage

The current state analysis (CSA) was conducted in three steps. The first step focuses on an overview and general analysis of the ISO 20000 Certification and Development project's current status, in order to understand the overall situation of the processes and their status compared to the ISO 20000 requirements. In this step, key stakeholders were interviewed and findings from the pre-evaluation audit were discussed.

In the second step, the CSA, the areas to be developed were selected. The selection was based on prioritization of findings revealed in the first step of the current state analysis. The third step of the current state analysis included in-depth analysis of the selected development areas. The analysis was done by several interviews and discussions. Additionally, internal documents were analyzed to gain better understanding of the current procedures.

The third step summarized the overview of the current state of the project and the processes, and at the same time focused on a more detailed analysis of selected processes to be developed in the study.

Overall, the goal of the CSA stage was to understand the current statuses of the processes subject to the upcoming audits, but also to select the development areas and analyze their current state, for building the proposals in the next sections. The CSA was based on Data 1 of the study gathered from four interviews, from the pre-evaluation audit results by Inspecta, and from the case company's existing process documentation. The results of the CSA analysis are discussed below.

3.2 Overview of the ISO 20000 Certification and Development Project in the Case Company

The ISO 20000 Certification and Development project in the case company was established to develop the operations, to ensure high quality SaaS service production. Figure 3 below illustrates an overview of the desired status before and after the development and ISO 20000 Certification and Development project.

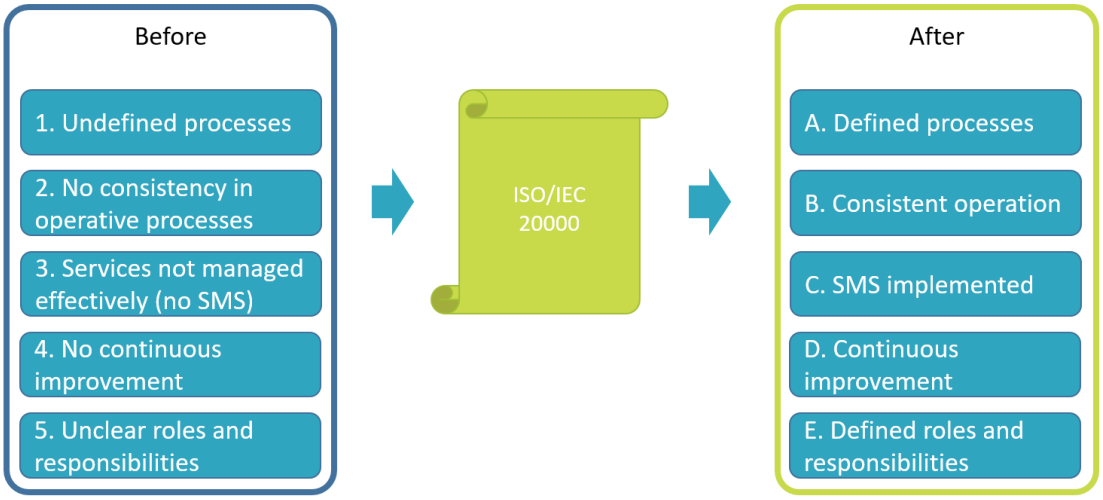


Figure 3. Overview of the stage before and the stage targeted after the certification.

As seen from Figure 3, the goal of the ISO 20000 Certification and Development Project is to improve many areas of the case company's operations. ISO 20000 sets requirements for these areas, and achieving the certification requires development in all these areas. The stage after the certification would allow the case company to deliver its services per higher levels of quality, including reaching the service level targets better. This study addresses the areas 1. and 5. in the figure above. Although, this study does not strive completely to reach the stages A. and E. due to the extent of the areas.

The selected approach for the development work related to the ISO 20000 Certification and Development project was first to gather all process documentation of the case company's internal ITSM processes to one directory. After that, existing process documents were merged with new process templates. As soon as the process documents were formatted in a similar fashion, the development work started, and the documents were aligned with the processes. In some cases, when there was no existing process, or when the process had major dissimilarities with ITIL, the process was planned to be aligned with the documentation, which was aligned with ITIL.

The goal of developing the documentation is that each process would have a description, a process policy and a summary. Also, for some processes there should a plan document (capacity management, availability management, continuity management etc.). As the documentations of the processes are complete, the intention is to hand over them to the process managers. Next, the initial CSA findings by Inspecta are presented.

3.3 Findings from Inspecta Pre-evaluation

The findings from the audit and internal interviews are provided in Table 7 on the next pages.

As seen from Table 7, only part of the ISO/IEC 20000 requirements were addressed in the pre-evaluation by Inspecta. Although, the findings reveal several issues that require further development or documentation, some documents or parts of them were missing.

Other challenges were related to the evidence from the testing plans and executive management reviews and internal audits. Since the standard requires having different plans and reviews (the continuity plan, availability plan, internal audit plan, management review), there must also be credible evidence of testing and usage of the plans.

Table 7 below provides details on the results of the pre-evaluation of the ISO 20000 Certification and Development project.

Table 7. Overview of the current state compared to ISO 20000 requirements (according to Inspecta's pre-evaluation findings and interviews).

Section	Requirement section	Pre-evaluation result	Gaps in section(s)	Inspecta findings from pre-evaluation
4	**Service management system general requirements**			
4.1	Management responsibility	GAPS	4.1.2	Service management policy must be established. Currently the policy refers to process policies.
4.3	Documentation management	GAPS	4.3.2	Document management must comply to requirements in section 4.3.2. Changes and versions must be possible to recognize. Should important documents be defined as CIs?
4.4	Resource management	N/A		
4.5	Establish and improve the Service management system	GAPS	4.5.2, 4.5.3	Practical plans for internal audits and management reviews are missing. Credible evidence is required from both. The service requirements are not defined. How are risks recognized, evaluated and mitigated currently? The section 11 in SMS related to this is empty.
5	**Design and transition of new or changed services**			
5.2	Plan new or changed services	N/A	N/A	N/A
5.3	Design and development of new or changed services	N/A	N/A	N/A
5.4	Transition of new or changed services	N/A	N/A	N/A
6	**Service delivery processes**			
6.1	Service level management	N/A	N/A	N/A
6.2	Service reporting	N/A	N/A	N/A

6.3	Service continuity and availability management	GAPS		No evidence of usage and testing of plans. Documents not complete. Risks are described, but the presentation of the risks needs to be improved. All documents exist, but they require further development. The risks are defined in the continuity plan, but this format can cause a static view of the risks.
6.4	Budgeting and accounting for services	N/A	N/A	N/A
6.5	Capacity management	N/A	N/A	N/A
6.6	Information security management	N/A	N/A	N/A
7	**Relationship processes**			
7.1	Business relationship management	N/A	N/A	N/A
7.2	Supplier management	N/A	N/A	N/A
8	**Resolution processes**			
8.1	Incident and service request management	N/A	N/A	N/A
8.2	Problem management	N/A	N/A	N/A
9	**Control processes**			
9.1	Configuration management	GAPS	N/A	A plan for developing the configuration management exists, but the effort required to implement the plan is big. Implementing the plan can cause a risk for the auditing schedule.
9.2	Change management	N/A	N/A	N/A
9.3	Release and deployment management	N/A	N/A	N/A

	Other findings from the pre-evaluation audit			
				Process documents seem to be based on ITIL-based template documents. Therefore, some terminology and roles does not seem to be similar to the case company's practices.
				Process specific goals and KPIs are in development stage.
				Should licenses be defined as configuration items?
				Should the definitions of the project status traffic lights be documented?
				A testing manager has not been nominated. Can this cause a risk for integration testing?
				What is the "Continual Service improvement - 7 steps improvement process management" found in the Change management document?

As seen from Table 7, there were many positive findings revealed by the pre-evaluation audit made by Inspecta. The findings pointing to the strengths of the ongoing ISO 20000 Certification and Development project are summarized in Table 8 below.

Table 8: Strengths of the current state according to Inspecta.

#	**Finding**
1	The development of the Service management system (SMS) is managed as a project (ISO 20000 Certification and Development project). The project has a directory in Sharepoint and agreed development actions are tracked and managed in Trello.
2	MyEfecte tool is used widely in the company, and it is developed constantly.
3	ITSM-projects [customer projects] are well defined and documented, and the projects are managed accordingly. A checklist is for handing over the project into production is used.
4	A project portfolio is maintained in MyEfecte, which gives a good overview of the projects.
5	Change management is supported by standard change types and automatic customer messages are supported in the tool. An integration between MyEfecte and Jira is under construction, to further support the change management process.
6	Tickets that are pending for customer comments sends automatic messages to customers. Tickets that does not get any further comments by customers, are closed in a specific time period.

7	Post implementation reviews (PIR) are done for projects that have been transferred to production stage.
8	Customer-specific service level agreements (SLA) are linked to the tickets.
9	An internal service catalogue is found in the intranet, and it is presented to new employees as part of the onboarding process.

As seen from Table 8, many strengths found in the pre-evaluation audit. For example, the ISO 20000 Certification and Development project and the customer projects were found to be managed well, and it was found that the tools (MyEfecte, Sharepoint, Trello) are used for managing the projects effectively. It was also found that MyEfecte supports many processes subject to the standard by featuring relevant functionalities, of which some automate the work to a certain degree.

However, not all processes were covered by the pre-evaluation made by Inspecta. To provide a complete view on the statuses of the processes and documentation, an internal investigation was done for the current state analysis. Findings from the internal investigation are presented in next section.

3.4 Findings from Internal Investigation

Throughout the case company's history, many of the processes required by ISO 20000 have existed, but most of them are not managed, defined or documented properly. Due to the general knowledge of the staff and usage of the case company's own tool intended for service management, most processes have been aligned only to a certain degree with ITIL.

The backbone for many of the ITSM-processes is the tool MyEfecte, which is based on the service provided by the case company to its customers: Efecte Service Management (ESM). In the context of the case company, it serves as a general service management system and in addition to the ITSM-process related functionalities, it includes some custom functionalities related for example to project management, customer relationship management, human resources management and sales

etc. Regarding IT-service management, the tool has been designed to facilitate ITIL based processes, and that is part of the reason why some internal processes are aligned with ITIL to some extent.

The ISO 20000 standard includes requirements to many processes that the case company has not needed urgently before the rapid growth and before transferring to cloud business. Processes interfacing directly with customers, like some Service Operations processes, have been used for a long time and seem to comply quite well with the current requirements. Nonetheless, the lack of documentation, proactive process management and defined roles and responsibilities have caused a situation in which the processes are not completely known, measured and managed. Also, due to the lack of completely managed processes, the MyEfecte tool has ended up in a state which does not comply with the ISO 20000 requirements, mainly regarding the CMDB.

Results from the internal investigation based on interviews is presented in the table below.

Table 9. Findings from the internal investigation.

Section	Requirement section	Status	Comments
4	**Service management system general requirements**		
4.1	Management responsibility		The policy must be defined, it is in progress.
4.3	Documentation management		Versioning of documents (inside the document, table) is in progress.
4.4	Resource management		Efecte HR responsibility. Not actively maintained. Some information exists in MyEfecte and in the HRM system. HR has planned to establish this in 2018.
4.5	Establish and improve the Service management system		Internal audits and reviews should be arranged. Recognition of risks, evaluation and management. Should be defined in SMS. The SMS is in progress.
5	**Design and transition of new or changed services**		
5.2	Plan new or changed services		Related to “Service to support”
5.3	Design and development of new or changed services		Handled in Release management process
5.4	Transition of new or changed services		Change management, application development, sales
6	**Service delivery processes**		
6.1	Service level management		Documentation on template level. Incident SLAs in tool. SLAs defined in customer agreements, if not standard SLA. Non-standard SLAs also in MyEfecte (automated).
6.2	Service reporting		Documentation is in progress. All reports defined in the document is not implemented to MyEfecte. Process KPIs are not complete (Inspecta).
6.3	Service continuity and availability management		N/A. Continuity plan exists, although it’s not complete. Availability plan is not done.
6.4	Budgeting and accounting for services		Documentation and process is approved.

6.5	Capacity management		Documentation exists, but the process is not implemented completely. Issues with monitoring? Implemented with new cloud team. Capacity plan is not complete.
6.6	Information security management		Documentation and process is aligned in some degree. The policy does not exist. Update: some policies exists, but they must be revised / aligned.
7	**Relationship processes**		
7.1	Business relationship management		Documentation and process is aligned in some degree. Business relationship management is taken care of by sales.
7.2	Supplier management		Process and documentation exists. The process is in use.
8	**Resolution processes**		
8.1	Incident and service request management		Process and documentation is aligned for incident management. Documentation for request fulfillment does not include all request types.
8.2	Problem management		The process is initiated 2/2017, problem manager is nominated.
9	**Control processes**		
9.1	Configuration management		Process documentation exists. Less than 50% of the documentation effort related to Cis is done. The CMDB in MyEfecte is in initial state.
9.2	Change management		Application development and operational change management integration ongoing. Standard changes are done, and the standard change models are going to be designed.
9.3	Release and deployment management		The process is established.

As seen from Table 9 above, most of the processes exist and have documentation. Although, the documentation is not aligned with the processes in all cases. Also, some processes or parts of them are not implemented completely or at all. The service management system (SMS), which is the main document that helps to manage the services is incomplete, since some sections of it are not written and implemented.

In addition to the previously mentioned issues, some particular processes stood out in the internal investigation. The Capacity Management process is not established formally, although activities related to capacity management are practiced. Also, the Software Asset and Configuration Management process lacks a lot of documentation as well as a proper implementation / refresh of the CMDB.

3.4.1 Findings Related to the Process Manager Roles

Until autumn 2017, the Director of Support & Operations was responsible for most of the processes related to ISO 20000. Recently, new process managers have been nominated for the Change management, Service request management, Problem management and Software asset and configuration management processes. Although, the roles still do not seem to be implemented completely. The implementation of the roles is still in progress, since the managers have been appointed only recently and do not have enough information on what is expected from them, and what their responsibilities include. Also, one finding from the interviews was that the ITIL knowledge of the process managers in general is not on the expected level.

In addition to these challenges, it was found that currently the process managers do feel that they do not have enough time for managing the processes, since the workload caused by other tasks is high. The responsibilities of the process manager role also include development of the tool (MyEfecte) which facilitates the processes. This responsibility does not seem to be fulfilled at least proactively now, and the tool does not facilitate all processes in the best possible manner. It was found that MyEfecte would need constant and proactive development. Regarding this, it was suggested that the ownership of the tool should be defined, and that there should be one consultant developing MyEfecte on a regular basis, in cooperation with the process managers.

3.4.2 Findings Related to the Process Documentation

The documentation of the case company's ITSM processes consists mainly on three documents per process: (a) a process description, (b) a process policy, and (c) a summary. Some processes have also a plan document. The summary is a PowerPoint presentation, that bases on the process description and the policy.

At the time of making the current state analysis, the process descriptions and policies exist for all processes subject to the ISO 20000 standard. However, the content of the documents does not correspond to the reality in all cases but indicates target levels for the processes. As the pre-evaluation audit and internal investigation stated, some process documents are ITIL templates, which includes terminology, roles and responsibilities that are not recognized in the case company. In addition, the current state of the documentation changes constantly, since the ISO 20000 Certification and Development project works on the documentation, to align it with the current processes and ITIL best practice.

3.5 Summary of Key Findings from the Current State Analysis

This section summarizes and discusses the findings from the current state analysis. The CSA was done in three steps, which included interviews of several key stakeholders, analyzing the pre-evaluation results and internal documents. The finding revealed both strengths and challenges in conducting the ISO 20000 Certification and Development project.

The key challenges found in the current state analysis are summarized in Table 10 below.

Table 10. Summary of challenges found in the current state analysis.

#	**Challenge**
1	All processes are not implemented completely as defined by ISO 20000. See tables 7 and 9 for more information.
2	The current documentations do not comply with the actual processes, or the processes does not comply with the documentation.
3	The Support & Operations unit is not involved in the development work as much as desired or required.

4	Process manager roles are not implemented completely as required for proper process management. This issue is related to the ISO 20000 project, since the processes must be implemented and managed proactively, to fulfill the requirements set by the standard.

As seen from Table 10, the main challenges are related to the implementation of new processes, the alignment of the documentation with the actual processes, and to the implementation of the process manager roles. Most of these challenges are related to lack of time for internal development – many of the challenges would be possible to fix with more time allocated for it. However, the resources are limited, and the day-to-day tasks of the Support and Operations units consume the lion's share of time.

As seen from Table 10 above, and discussed earlier in the CSA, many of the required processes and documents exist, and some of the documents describe the processes accurately. However, some documents and processes (see Tables 7 and 8) require further development, since either the documentation is on a desired level, but the process does not correspond to the documentation, or the process is good, but the documentation does not reflect the process. There may be some uncertainty on which approach should be followed: should the process be changed to suit what the documentation suggests, or should the documentation be matched with the process.

Also, the CSA found that there may be some uncertainty on the requirements of ISO 20000. The uncertainty is related to the relationship between the documentation and actual processes and records: do the processes need to match perfectly to the documentation? The model of executing the project has potentially been related to challenges regarding the implementation of some processes in the planned schedule. Since a separate team has worked on the documentation, the actual organization using the processes has not been involved actively to the development work. This has possibly caused challenges related to implementations and the accuracy of the documentation.

In addition to challenges, the CSA also revealed many strengths, of which the most important ones are summarized in Table 11 below.

Table 11. Summary of strengths found in the current state analysis.

#	**Strength**
1	All processes have documented process descriptions and policies
2	Many of the required processes are practiced
3	Process managers are nominated for the most important processes
4	The development efforts are managed as a project
5	Systems and tools (MyEfecte, Trello etc.) are used extensively for managing customer projects, ITSM-processes and the ISO20000 project.

As seen from Table 11, the strengths found in the CSA are related mostly to processes and documentation that exists, in addition to systematic development of the operations. Also, the decision to nominate process managers to oversee important processes is a significant strength, since if the roles are implemented properly, it allows further development of processes, and proactive process management in overall. Although, as stated in the challenges in the previous table, the process manager roles are not implemented completely, but the nomination of the persons for the roles is a good start. The strengths imply that there are good pre-requisites to develop the service management system, the processes and operations in overall.

In this study, due to the large amount of areas to develop in the ISO 20000 Certification and Development project, it was decided with the case company representatives that not all areas are focused on in this study. The areas chosen to be developed in this study are presented in Table 12 below. The table also points to the corresponding theory for these areas to develop which will be addressed in the next Section 4.

Table 12. Areas to be developed in this study (focus areas) with corresponding theory (for search for best practice and existing knowledge).

#	**Areas to be developed**	**Corresponding theory**
1	Capacity management process	-Capacity management -Cloud computing
2	Implementation of process manager roles (issue 4 in table 10)	-Organizational change management -Organizational commitment and engagement

The areas chosen for development in Table 11 above were selected from many CSA findings. The capacity management process was selected due to the following reasons. First, it was found in the CSA that it was not implemented (its status was red in Table 7). The other areas classified with “red” status (service management system and configuration management) are developed by the VP of Services and the Configuration manager, respectively. Next, the capacity management process was selected since it is relevant for maintaining functional service and appropriate availability levels, which is a timely issue, since capacity challenges have been experienced recently. In addition to these reasons, by the time of making the CSA, it was known that two new cloud engineers were about to join the Cloud team in Support & Operations department. The point of time was found to be good for implementing the process, since the new engineers could start practicing the process right from the beginning of their duty.

The second area of development, implementation of process manager roles was chosen since the roles are essential for a successful implementation and development of the processes. By implementing the roles, the processes are supposed to improve constantly by the efforts made by the new roles. This way the case company’s operations are developed towards to requirements set by the ISO 20000 standard.

After selecting the focus areas, the study zoomed into the current state of the selected areas even further.

3.6 Current State of the Capacity Management Process

Based on the findings from workshops and discussions (Data 1), there is currently no defined and managed capacity management process in the case company. In spite of this, the relevant capacity management activities are practiced on a certain level.

First, the main activities related to capacity management has been focused around the installations of new cloud tenants. The installation of a cloud tenant implies that one or more of the case company's products (applications) are installed on a virtual computer (on the docker platform in a container). As the application requires capacity related resources such as computing power, memory and storage to function, the underlying virtual computer's resources must eventually be considered and adjusted while installing the tenant.

Next, the capacity of the installation is considered in the beginning of the lifecycle of the installation and later, if capacity related incidents occur. There are guidelines for allocating resources for a baseline setup of Efecte Service Management (ESM), but it does not cover most of the situations, since few of the installations have a baseline setup. Customized configurations require usually a different resource allocation, and computing power, memory and size of the database must be considered individually. This has been done by a gut feeling, and by trial and error. Although, some basic information about the capacity requirements are gathered, such as number of licenses, but the information is not always utilized due to the lack of a formal process.

Presently, allocating tenants to the virtual computers does not have a policy, and situations with too many tenants or too many capacity-consuming tenants are allocated on same virtual computers are possible. There has been an investigation of moving to a policy that allows only 5 tenants per virtual computer, or even to only dedicated environments.

Currently, a monitoring tool (PRTG monitoring) is used for viewing capacity related reports. The software provides thorough monitoring possibilities, but all of them are not necessarily utilized. There were found challenges related to thresholds of the monitoring, since currently there are a lot of "false alarms". This is probably caused by improper settings or configuration of the monitoring tool. It was also found that capacity reports are stored only in the monitoring tool, which provides a history of 365 days. Therefore, capacity reports on a longer timescale do not exist, and trend analysis on longer scale is not possible. This situation is although very intelligible, since capacity management has

been practiced only on an operative level, and there has not been a need for reports on longer time-scale.

In addition, the role of monitoring for proactive actions is questionable, since due to the challenges related to monitoring itself, and the workload of the employees, capacity related or other incidents are sometimes detected by the customer or Service Desk, instead of the monitoring tool.

Overall, the capacity management process has a process description in addition to the capacity plan. The description does describe ITIL's practices, but all the described practices do not exist, or they do not correspond with the actual ways of working. The capacity plan has a good structure and some parts of the plan's content is accurate, but the plan requires still further development.

The strengths of the capacity management process are summarized in Table 13 below.

Table 13. Strengths related to the capacity management process.

#	**Strength**
1	Capacity management activities are performed by a capable and professional cloud team.
2	The cloud team is open to improvements related to capacity management and other issues.
3	Process documentation and a capacity plan exists.
4	Monitoring works well for most parts.

A significant strength of the current state is that it allows further development of the process. Since capacity management activities exist, and the key persons welcomes improvements, there is a good basis for further development of the process.

The challenges of the capacity management are summarized in Table 14 below.

Table 14. Challenges related to the capacity management process.

#	**Challenge**
1	The capacity management process does not support gathering and translating customer requirements to capacity related server specifications.
2	There is no formal policy for allocating tenants to [virtual] servers.
3	The capacity plan needs improvements
4	The current capacity management activities are not proactive.
5	Monitoring thresholds are not set up correctly
6	The monitoring software stores capacity reports only one year back.

The challenges summarized in the table above are all relevant, yet possible to improve. The challenges 1–4 require possibly more effort, than the challenges 5 and 6 in table 14. Challenges 1 and 2 are significant, since the issues affect directly the performance and availability of customer environments. Thus, due to the nature of the business, capacity management process has been needed in the case company.

Next, this study will focus on discussing the industry best practice and available knowledge for improving these selected areas. Table 15 shows the theory that is explored later in the following section, related to the areas that were selected to be developed in the current state analysis findings.

Table 15. Areas to be developed, with corresponding theory sections.

#	**Area to be developed**	**Section**
1	Capacity management process	4.1 Cloud Computing 4.2 Capacity management
2	Implementation of process manager roles (issue 4 in table 10)	5.1 Organizational change management 5.2 Organizational engagement and commitment

As seen from Table 15 above, the linkage between the CSA results (areas to be developed) and theory sections is straightforward. Due to the broad extent of the areas, both are discussed in separate sections, starting from organizational change management discussed in this section. The area of cloud computing is discussed in Section 4.1, and the area of capacity management is discussed in Section 4.2 next.

4 Available Knowledge and Best Practice on Capacity Management and Cloud Computing

This section discusses available knowledge and best practice related to capacity management and cloud computing. Cloud computing is discussed briefly, to provide a general understanding of the context to which capacity management is applied in this study. In this section capacity management is discussed from a cloud environment's point of view, without going to the technical details on how to manage capacity in non-cloud-based environments.

4.1 Cloud Computing

Cloud computing bases on the idea that computing can be made more efficiently in large farms and organized centrally as a public utility like water and electricity. In cloud computing, the computing resources are in distant data centers, and they are accessed over the internet (Marinescu, 2013, p. 1). Today, cloud computing has been widely accepted in most industries, but as with anything new, it lacks standards and best practices (Kavis, 2014, p. 11).

In addition to the multiple benefits related to centralization of the computing power to large farms, cost savings can be achieved because of the multiplexing of resources and due to the economy of scale (Marinescu, 2013, p. xiii). Although benefits of cloud computing are many, some examples could be the ease of use and access due to the device and location independency, scalability of the computing and storage services and potentially improved maintenance and security. Also, the services can be metered in the way that it is possible to charge the customer only for the used capacity (Marinescu, 2013, p. xiii). This way of charging only for the used capacity may result in direct savings; the consumer of the services does not have to worry about paying for capacity which is not in use always.

Cloud computing can be set up in many different manners, since different delivery and deployment models are used, depending on the customer requirements. Also, the infrastructure, resources and defining attributes vary case by case. Figure 4 gives an overview of cloud computing in general. Figure 4 shows key application areas related to cloud computing.

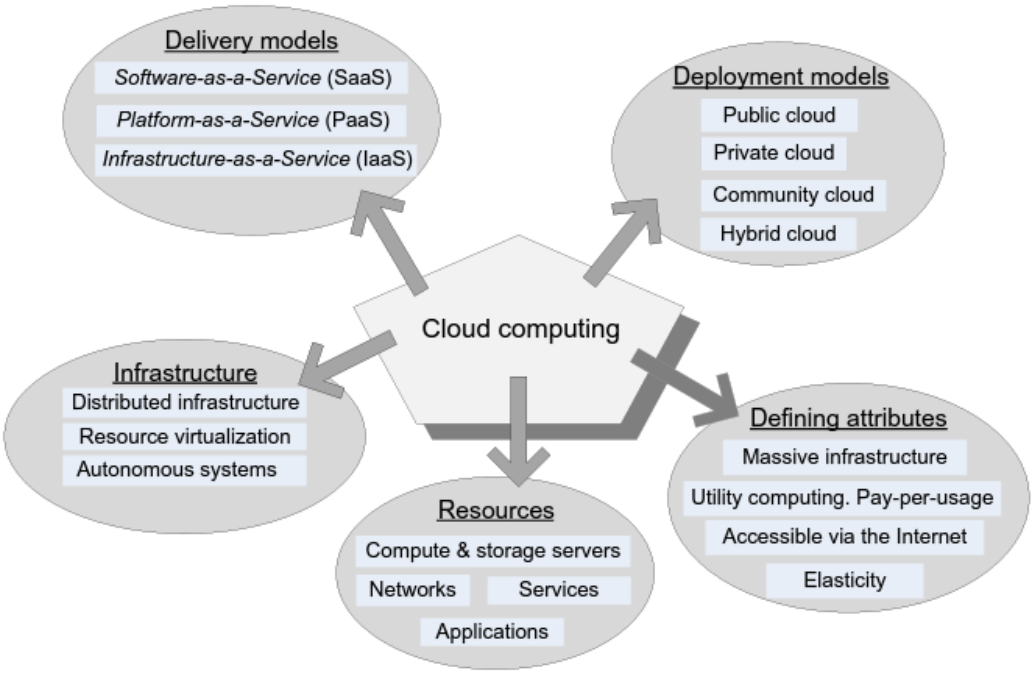


Figure 4. Cloud computing: delivery, deployment, infrastructure, resources and defining attributes (Marinescu, 2013, p. 2)

As seen from Figure 4, there are three main delivery models, along with four deployment models used in cloud computing. Software as a service (SaaS) means that a service is provided to the customer as a complete application. The service provider takes care of everything related to the delivery of the service. In the platform as a service (PaaS), a platform on the top of the infrastructure is provided to the customer: the responsibility of the application level remains at the customer. In the infrastructure as a service (IaaS), the provider responds for the infrastructure – the customer takes care of the platform and application levels (Kavis, 2014, pp. 13-18). With these options, it is important for the customer to know which of the delivery models to use – they are all there to fulfil diverse needs and requirements.

As the delivery models, also the deployment models vary, and there are four main options: public, private, community and hybrid cloud deployments. A public cloud's infrastructure is made available to the public or a large industrial group, opposed to the private cloud, which infrastructure is dedicated for one organization. A community cloud is shared to multiple organizations, which may have shared concerns (e.g. security requirements). A hybrid cloud deployment is a combination of the previously presented deployment models (Marinescu, 2013, p. 9). The choice of the deployment model depends also on customer needs and requirements, which can be related to performance or security requirements.

Cloud computing was discussed on a general level in this section to gain a basic understanding of the topic, which is essential, to understand the context of capacity management discussed in next section.

4.2 Capacity Management

This section discusses the capacity management process defined in ITIL, including some additional viewpoints of the topic. Along with discussing the process, its sub-processes and capacity planning in general is discussed. These areas were selected to support the implementation of the capacity management process in the field of SaaS cloud operations.

The capacity management process strives to provide IT capacity that matches to the current and future business needs. Also, the process must ensure that the provided capacity is balanced against justifiable costs (van Bon et al., 2007, p. 87). The main objective for Capacity management is "to ensure that the service provider has, at all times, sufficient capacity to meet the current and future agreed demands of customer's business needs" (van Bon et al., 2006, p. 48). Another important objective of the Capacity management process is to produce a capacity plan (Axelos, 2011). Information on capacity and performance of services is stored in a Capacity Management Information System (CMIS), which is an important part of the capacity management process, according to van Bon et al. (2007). The CMIS information is stored and analyzed by capacity management's sub-processes, to produce the capacity plan and reports (Cartlidge et al. 2007).

The capacity management process is defined in ITIL's service design publication, which also defines processes such as information security management, service level management, availability management and service continuity management (Sabharwal & Wali, 2013, p. 20). According to Axelos (2011, p. 157), ensuring that capacity related issues are considered in the design phase of a service is a key success factor in managing capacity later in the service lifecycle. The three sub-processes of capacity management support the process and allows it to manage the capacity throughout the service lifecycle, since the capacity management process is stated to be "extremely technical, complex and demanding". (Axelos, 2011.) The sub-processes are discussed briefly in the next section.

4.2.1 Business Capacity Management

Business capacity management is the high-level aspect of capacity management, which focuses on translating business needs and plans into requirements for services and infrastructure on a long-term view (Axelos, 2011, p. 161; Sabharwal & Wali, 2013, p. 42). Also, as Sabharwal & Wali puts it, the capacity management process is "ensuring that future business requirements for IT services are

quantified, designed, planned, and implemented in a timely manner", while also analyzing business workloads (Sabharwal & Wali, 2013, p. 42). The service strategy and service portfolio provide input to the capacity management in form of information on future requirements mentioned above (Axelos, 2011, p. 161).

Activity based demand management provides input to business capacity management. Existing data, such as business strategy, business plans, business processes and business activities are taken into consideration, while translating the business demands into capacity requirements. Also, a cloud service provider can seek for business capacity requirements from many other sources, such as usage trends, surveys, performance optimization reports, along with analyzing its service request types and usage of them. (Sabharwal & Wali, 2013, p. 43.) According to Sabharwal & Wali (2013, p. 44), the main activities for predicting future business requirements could be summarized to "trending, forecasting, prototyping and sizing" of data.

Patterns of Business Activity (PBA) is an activity of the ITIL's demand management process (defined in ITIL Service Strategy publication), which serves as a primary source of expected demand. In PBA analysis, business demand patterns are identified and analyzed, after which forecasts are created and communicated further. The variability and frequency of the demand is taken into consideration in PBA analysis, as the demand may be different during specific days, months or other periods (Sabharwal & Wali, 2013, p. 46). Service level management (SLM, defined in ITIL's Service Design) play an interface to the PBA analysis, since changes in service levels should be considered in PBA analysis (Sabharwal & Wali, 2013, p. 47). Ultimately, the service levels set requirements also to the capacity.

While discussing capacity management, the process activities depend on the position of the company in the cloud related issues. A company can at least provide, consume or provide and consume cloud services, by different delivery and deployment models. Main activities for a cloud service consumer would be financial planning, business forecasting, PBA analysis, estimating demand, service level negotiations and process re-engineering. Regardless on the delivery models used, the consumer should focus on cost reduction, which may be challenging, due to the amount of cloud providers, pricing models and changing prices. (Sabharwal & Wali, 2013, pp. 47-48.)

4.2.2 Service Capacity Management

In some cases, companies act as “cloud aggregators” which is defined by Techtarget (2011) as “a type of cloud broker that packages and integrates multiple cloud computing services into one or more composite services.” As a company is acting as a cloud aggregator, it may not need to take care of the component level discussed in next section, but still needs to practice service capacity management, which is a sub-process of capacity management, and consider the following issues. Service capacity management strives to ensure that the services meet the required needs, by identifying and understanding the cloud services. In practice, this is done by recording, monitoring and analyzing the use of resources, working patterns, and variance in usage. (Sabharwal & Wali, 2013, pp. 48-49; Axelos, 2011, p. 161.)

As suggested by Sabharwal and Wali (2013), a cloud service provider should measure the following parameters found in Table 16 below.

Table 16. Key parameters for service capacity management suggested by Sabharwal and Wali (2013).

#	**Actions**
1	Data collection and thresholds
2	Analysis of the current and future usage of the services
3	Roll ups of individual components which constitute the cloud service
4	Monitoring of SLAs
5	Workloads at various locations/datacenters

6	Proactive and reactive actions to enhance capacity

These parameters are suggested to be measured by both cloud providers and cloud aggregators, to ensure that the services are available for use. In addition to measuring these parameters, actions should be taken based on the findings.

From a cloud consumer's point of view, Sabharwal and Wali (2013) suggests that the consumer does not have to worry about how the service capacity is managed by the cloud provider but monitoring the provider's service level agreements (SLA) is still essential, to ensure the prerequisites for the consumer's services that are running in the provider's cloud.

In addition, the cloud consumer should also monitor their own services that are ran in provider's cloud, and take necessary actions, to manage the capacity of the services (Sabharwal & Wali, 2013, p. 50). This helps to ensure that agreed availability levels of the cloud consumer's services are met.

4.2.3 Component Capacity Management

Cloud services are delivered usually by datacenters which consists of different components including, for example, servers, storage and network components. Component capacity management strives to "identify and understand the resource requirements, performance levels, and utilization trends of each of the individual components within the cloud environment" (Sabharwal & Wali, 2013, p. 52). To achieve this, ITIL suggests that data regarding individual components would be monitored and measured. Then, the collected data could be recorded, analyzed and reported. (Axelos, 2011, p. 161.)

Regarding the component capacity management, the cloud provider should, according to Sabharwal & Wali (2013), monitor the aspects provided in Table 17 below.

Table 17. Aspects to be monitored by cloud providers according to Sabharwal & Wali (2013).

#	**Aspect**
1	Availability of each service

2	Performance of each service
3	Availability of components
4	Performance of components
5	Availability of integrations
6	Performance of integrations

This data is collected from the datacenters by using highly automated tools. The data is used for the provider's capacity management and planning, but also for billing purposes. The cloud consumer may also monitor some of these aspects, and use it for their own capacity management, depending on the used delivery model. All the sub-processes of capacity management contribute to producing the capacity plan, which is discussed next.

4.2.4 Capacity Plan

According to Sabharwal & Wali (2013), the process of capacity planning starts with translating business needs to applications needs, which are further translated to "application related performance and capacity requirements". These requirements are translated to infrastructure capacity requirements (Sabharwal & Wali, 2013, p. 80). In this context, infrastructure capacity requirements are mainly considered by cloud providers.

As one could expect, a capacity plan is a plan for how to manage capacity; IT capacity in this context. ITIL defines an example of a capacity plan's content, which is included in the Service Design publication. Even though ITIL's example of a capacity plan is extensive and thorough, according to Klosterboer (2011, p. 63), it may be too "heavy" for some organizations, and therefore only the needed parts should be focused on.

The procedures for creating a capacity plan are, according to Sabharwal & Wali (2013, p. 82), to document capacity requirements, to document design and methods used and finally to produce the overall plan. The capacity plan can be formatted to include different plans, according to Klosterboer (2011, pp. 63-66) the plan could consist of multiple service capacity plans and component capacity plans, for each service and component, respectively. Although, Sabharwal & Wali (2013, pp. 137-144) suggest that the plan can be formatted as one plan, that covers all required aspects.

A basic capacity plan should include the following four essential elements, according to Klosterboer (2011): an introduction, the total available capacity, past utilization and future demand and finally observations and recommendations. In addition to creating a capacity plan, it has also to be maintained, since it is a living document, that should be actively managed, to support decision-making in capacity related issues (Klosterboer, 2011).

4.2.5 Critical Success Factors and Key Performance Indicators for Capacity Management

ITIL suggests several critical success factors and key performance indicators for the Capacity management process. Some of them may not be relevant for cloud operations in a relatively small-scale context, and therefore not all the CSFs and KPIs are included in Table 18 below.

Table 18. Selected CSFs relevant to cloud environments in small scale operations, including their related KPIs, based on ITIL (Axelos, 2011, p. 178).

	CSF	**KPI**
1	Accurate business forecasts	Production of workload forecasts in time
2		Percentage of accuracy of forecasts of business trends
3		Timely incorporation of business plans into the capacity plan
4		Reduction in the number of variances from the business plans and capacity plans
5	Knowledge of current and future technologies	Increased ability to monitor performance and throughput of all services and components
6		Timely justification implementation of new technology in line with business requirements (time, cost and functionality)
7	Ability to demonstrate cost effectiveness	Reduction in the over-capacity of IT
8		Accurate forecasts of planned expenditure
9		Reduction in the business disruption caused by a lack of adequate IT capacity

10	Ability to plan and implement the appropriate IT capacity to match the business need	Percentage of reduction in the number of incidents due to poor performance
11		Percentage reduction in lost business due to inadequate capacity
12		All new services implemented match SLRs (service level requirements)
13		Reduction in the number of SLA breaches due to either poor service performance or poor component performance

Axelos (2011, p. 178) suggests that these ITIL's CSFs and KPIs are samples, and that each organization should choose appropriate CSFs and KPIs, based on the maturity level of the organization. Also, they should not be adopted without careful consideration.

Now, as the topic of capacity management is handled in the previous sections, the discussion moves on to organizational change management.

5 Available Knowledge and Best Practice on Organizational Change Management

This section discusses available knowledge and best practice related to organizational change management. This area has been selected to support the study in improving the implementation of the process manager roles. In this context, (organizational) change management should not be confused with change management related to IT.

5.1 Organizational Change Management

Since organizational changes affect people in many ways, organizational change management (OCM) strives to manage the aspect related to people in an organizational change. OCM strives manage the change by identifying and managing the resistance related to it (Ferris, 2016). This section discusses organizational change management in general, including concepts and definitions. Then, change types and models are discussed in separate sections, to provide a general understanding of organizational change. After this, resistance of change is discussed, after which the discussion moves finally to the characteristics of successful change. In depth discussion of certain areas of organizational change management can be found in Appendices 7-11.

5.1.1 Definitions and Overview of Organizational Change Management

Organizational change management can be defined as the “transformation and modification of whole organizations” (Hayes, cited in Muchira & Kiambati, 2015, p. 214). Kotter (cited in Muchira & Kiambati, 2015, pp. 214-215) defines organizational change management as an “approach to transitioning individuals, teams and organizations to a desired future state”. Organizational change can also be defined as a field of organizational research, with focus on change in organizations during time (Kuusela & Kuittinen et al., 2008). According to these definitions, organizational change management is an approach to manage changes related to organizations – including the people working in the organizations.

There are different forces that drive the need for organizational change. According to Anderson & Anderson (2010a, p. 32), it is important to understand what drives the change, since it defines the context within the change occurs, and since it forms the purpose for the change, for both the targets of the change and the leaders of the change. Anderson & Anderson (2010a, p. 33) suggests a 7-step model that explains the drivers of change. The model steps start from the broad external drivers, and then moves to the internal and personal drivers.

Figure 5. The Drivers of Change Model by Anderson & Anderson (2010a, p. 33)

The Drivers of Change Model presents the drivers for change and describes briefly the relationship between them. Each one of the types of drivers are related to the previous and next types of drivers in the figure above. External drivers, which include the environment, marketplace requirements, business imperatives and organizational imperatives, comprises dynamics that occur in the large context, which can be related to customer requirements, strategical actions and requirements to the organization. Internal and personal drivers starting from cultural drivers, going to leader and employee behavior and finally to leader and employee mindset, are related to how people work, think and act as organizations and individuals. (Anderson & Anderson, 2010a, pp. 33-35.)

In addition to understanding the drivers of change, also the type of change is worth considering, while leading and planning the change. According to Anderson & Anderson (2010a, p. 51), for leading a change effectively, the leaders must know the type of change. The three main types of changes defined by Anderson & Anderson (2010a, pp. 51-64) are briefly presented in appendix 7.

Due the fact that organizational changes can be hard to manage successfully, some authors have suggested models to manage changes effectively. In appendix 8, Kotter's (1996) and Lewin's (1952, cited by Elearn, 2007) change models are combined into one table, while also suggesting a linkage between the authors' model steps. The appendices 7 and 8 can be used for gaining further understanding of organizational change.

5.1.2 Resistance to Change

Successful organizational change tends to be hard to achieve, probably since people are always involved in changes. The human nature is complex, and therefore the dynamics of the human nature should be considered straight from the design phase of the change. Better change results, a more committed workforce or healthier workplace, more sustainable operational performance and greater change capability can be achieved by considering these human dynamics while planning and leading the change. (Collins & Porras et al., 1998, p. 139; Anderson & Anderson, 2010a, pp. 132-133.)

One part of considering the human dynamics is to acknowledge that humans have some core needs, that should be considered while leading change. The core needs of the people subject to the change can be triggered by the events related to it. The core needs defined by Anderson & Anderson are presented in Table 19 below.

Table 19. The human core needs (defined by Anderson & Anderson, 2010a, pp. 140-141).

#	**Core need**	**Details or examples**	**Examples of groups**
1	Security	Physical and emotional safety	-
2	Inclusion and Connection	Being part of a group	-
3	Power	Control of the outcome of the process	-
4	Order and control	The need of logic and order	Finance, risk management
5	Competence	The feeling of being capable	Sales, health care clinicians

6	Justice and fairness	Needing things to be fair	Human resources

These core needs are common for all humans, although one or two of them are usually dominant. In a change, people need to perceive that the needs will be met, otherwise they will unconsciously resist it, since they relate the change as threat to their core needs. The same unconscious reaction keeps the people from perceiving the good aspects of the change. While planning and leading the change, the core needs can be considered on individual or group level. The members of groups or departments may have similar core needs (examples in table 15), and therefore the change can be designed to suit to the main core needs of the groups, if individual core needs cannot be completely considered. (Anderson & Anderson, 2010a, pp. 140-145.)

In addition to the human core needs, there are also other aspects worth considering. Collins & Porras et al. (1998, pp. 141-142) suggest that organizational changes may affect the employees' *personal compacts*, which define the relationship between the employees and the organization. These personal compacts are discussed in appendix 9 and can be used for gaining further understanding on how to redefine the personal compacts and therefore to manage change. Key focus areas of organizational change management discussed in next subsection.

5.1.3 Key Focus Areas and Common Challenges of Change Leadership

According to Anderson & Anderson (2010a), there are three critical focus areas that require attention while reaching for satisfactory results from change initiatives. The areas are content of change, the people in change, and the process of change.

The first one of this, the content of change, refers to what is subject to change; the tangible aspect of change. Examples of the content could be processes, technology, structure, products and services. This aspect is quite clear since the content of change is relatively easily observable, opposed to the next focus area, the people in change.

The second area is related to the human dynamics of change, discussed in the earlier sections. The area can include handling of behavior, mindsets, relationships, engagement, culture and many more aspects related to the human dynamics.

The third suggested focus area of change leadership is the process of change. This focus area is related to considering how the change is planned and implemented, and it is highly interdependent

with the people aspect of the change. (Anderson & Anderson, 2010a, pp. 24-25.) A big mistake in leading change could be done by allocating focus only or mainly to the content of change. Although, focusing on the mechanical is not enough, if there are no committed employees and a functional process that build up the change (Anderson & Anderson, 2010a, p. 25).

There are also many other common mistakes that can be made while leading change. Kotter (1996) presents eight common mistakes related to leading major change while Anderson & Anderson (2010a) present mistakes related to change initiatives in general. These common mistakes suggested by both authors are presented in Appendices 10 and 11.

5.2 Organizational Engagement and Commitment

Organizational commitment can be defined as “the relative strength of the individual’s identification with, and involvement in, a particular organization”. It consists of three factors, which are 1. a strong desire to remain a member of the organization, 2. a strong belief in, and acceptance of, the values and goals of the organization and 3. a readiness to exert considerable effort on behalf of the organization. All these factors together form the commitment of an individual in an organization. (Porter, 1974, cited by Armstrong, 2006, p. 271-272.) Being committed to work, leads to engagement, which means that the individuals are interested and excited about the work. Although, according to Armstrong (2006, p. 281), job engagement can exist without commitment to the organization, if the employee is engaged mainly with the type of work, but not committed to the organization. This can occur especially with knowledge workers.

Since humans detect sensitively signals related to rewarding and acceptance, employees participate willingly to activities that seem to generate rewards in the environment. Generating commitment and engagement is although more complex than this, since it is related to feelings and intuitive experiences. The supervisor’s role is important here, since his behavior affects greatly the employee’s motivation, which in turn may impact the commitment and engagement. Positive feedback is also an essential factor of creating motivation, since according to Viitala (2003, p. 161), external recognition is a significant confirmation of the individual’s success. In case an employee does not receive any feedback, it is possible that the employee feels that the effort has no significance or value at all. Therefore, it is important for managers to provide the employee with feedback, also with negative, since the employee learns from the feedback, even though it would be negative. Nevertheless, the amount and type of negative feedback should be seriously concerned, since negative feedback can also create a negative spiral, since the employee can start to avoid contexts in which he has received negative feedback. (Viitala, 2003, p. 160-162.)

To conclude, both positive and negative feedback are important for the employee, since it eventually increases the employee’s belief in his own skills and opportunities to develop further, and therefore increases motivation, commitment and engagement. (Viitala, 2003, p. 160-162.) Based on these points, the supervisor’s or managers role is important in creating commitment and engagement, due to the hierarchical position that influences the employee. Also, there are other aspects that enhance the commitment and engagement. According to Armstrong (2006, p. 279), employee’s feeling of belonging to the organization can be improved, if a there is a sense of ownership. The sense of ownership if developed, if the employee is involved in decision making, and if the employee feels that he is genuinely accepted by the management as a key stakeholder in the organization.

Llopis (2015) suggests also that putting the employee in a position of influence can enhance engagement. Micromanaging employees can have a reverse effect, and instead of that, Llopis suggests that the management should make the employees feel trusted and valued, which is supposed to improve engagement. As Llopis puts it, “employees are most engaged when they that feel a sense of responsibility towards their leaders and the example their performance sets for others”. (Llopis, 2015).

Another, factor of creating commitment and engagement is sufficient communication. According to Armstrong (2006, p. 279), to commit, people need to understand to what they are expected to commit to. The understanding can be created by communicating the goals and expectation clearly, by using various channels. The table below summarizes the factors influencing the employee’s commitment and engagement positively, based on Armstrong, Viitala and Llopis.

Table 20. Factors that increase commitment and engagement (Armstrong, 2006, pp. 271-279; Viitala, 2006, pp. 160-162; Lopis, 2015).

#	**Factor**
1	Rewarding of good performance
2	Acceptance of the employee
3	Positive and negative (constructive) feedback
4	Creating sense of ownership and possibility to influence
5	Clear communication of expectations

Now, as existing knowledge of capacity management and organizational change management is discussed in the previous sections, the discussion moves on to the proposal building stage of this study, after briefly presenting the conceptual framework used for the proposal building stage.

6 Conceptual Framework of This Study

For building the proposal to the case company, literature and existing knowledge were inspected in search for best practice. The identified existing knowledge is merged into the conceptual framework, which is used for building the proposal.

The conceptual framework consists of three main elements: organizational change management, cloud computing and capacity management. These elements were chosen to address the areas chosen for development in the current state analysis, to find solutions and address them in the proposal. The elements to be used in the proposal are shown in table 21 below.

Table 21. Conceptual framework to be used for the proposal (based on search for best practice from literature and existing knowledge).

#	**Topic**	**Definition / Purpose**	**Contents**
1	Organizational change management	"Approach to transitioning individuals, teams and organizations to a desired future state" (Kotter, cited in Muchira & Kiambati, 2015).	-Change types -Change models -Resistance of change -Key focus areas -Common mistakes -Organizational engagement and commitment
2	Cloud computing	"A model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and re-	-Overview -Delivery models -Deployment models

		leased with minimal management effort or service provider interaction" (Mell & Grance, 2011).	
3	Capacity management	"To ensure that the capacity of IT services and the IT infrastructure meets the agreed capacity and performance-related requirements in a cost-effective and timely manner" (Axelos, 2011, p. 158)	-ITIL -ISO/IEC 20000 -Capacity management process and various aspects of capacity management -Key success factors

The first topic, organizational change management, focuses on the diverse types of change, change models, key focus areas and common mistakes while leading change. Also, the topic of resistance of change was addressed, to provide best practice on how to design change that encounters as little resistance as possible and how to mitigate resistance.

The second topic, cloud computing provides a brief overview of cloud computing, to provide an understanding of the context in which capacity planning is discussed in this study.

The final element of the conceptual framework, capacity management, is addressed from ITIL's perspective, and discusses the process, capacity planning and diverse aspects of capacity management. The topics used in the literature study are summarized in Figure 6 below.

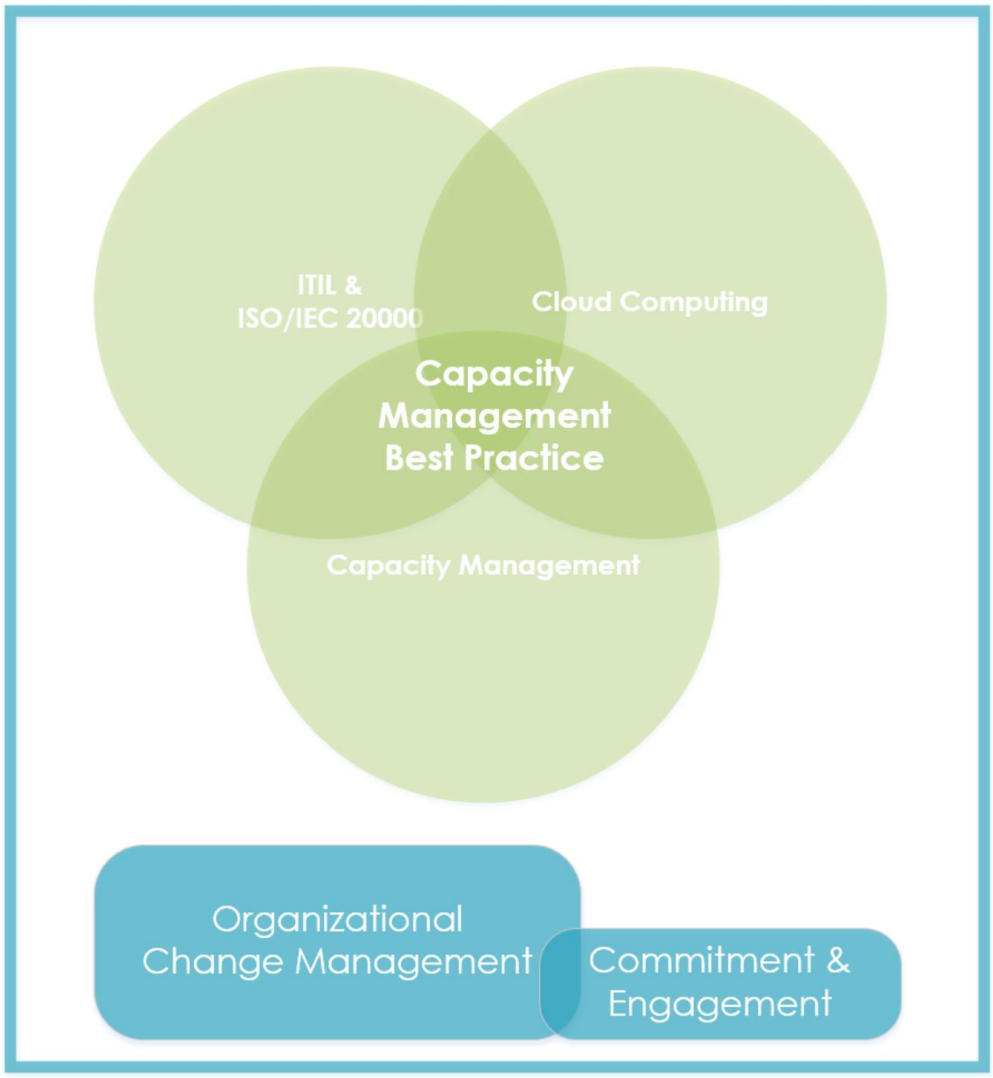


Figure 6. Contents for the literature study.

The topics shown in Figure 6 above are used for identifying the relevant areas for search for best practice and existing knowledge. The identified elements of best practice and relevant knowledge from these areas were merged into the conceptual framework to be used for building the proposal.

Existing knowledge on *capacity management* especially forms the basis for building the proposal. The topics of cloud computing, ISO/IEC 20000 standard, and ITIL, complement the topic of capacity management.

At the same time, *organizational change management* provides knowledge of how to lead change, such as development projects in organizations. Next, the proposal building stage is presented that uses both areas for building the proposals.

7 Building Proposal for Improving the Capacity Management Process and Implementing the Process Manager Roles

This section describes the initial proposal for the case company, which merges the findings from the current state analysis (Section 3), ideas from theories and best practice compiled into the conceptual framework (Section 4), and findings from the proposal building stage (Data 2, Section 5).

Since the proposal deals with two areas selected based on the current state analysis, the topics are presented in separate sections. First, the logic of the proposal building stage is presented. Then, the inputs (Data 2) of the case company are presented. Finally, the proposals for the two development areas are described.

7.1 Overview of the Proposal Building Stage

Figure 7 below shows the logic of building the proposal and points to the linkage between the theory and practical findings used for making the proposal.

As seen in Figure 7, first, the areas to be developed were chosen in the current state analysis based on Data 1. Then, the theory topics were selected based on the challenges identified in the CSA stage, to address them in the proposal building. Figure 7 below also shows how the theory has been used for building the proposal.

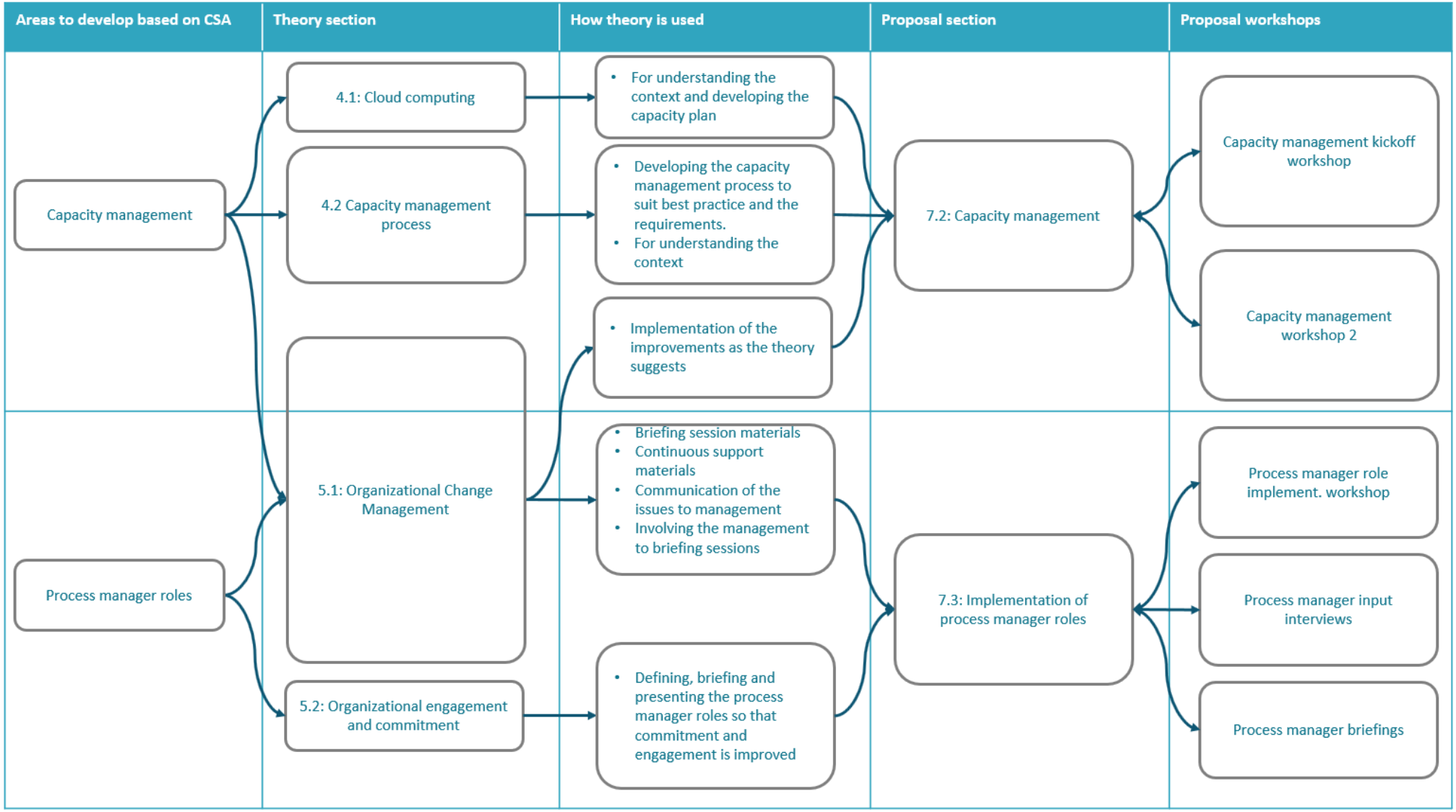


Figure 7. Linkage between the areas and sections related to the proposal building.

As for the action steps in the proposal building, Figure 8 below show how the proposal was built, step by step.

The action steps were planned to ensure that the proposal would addresses the areas chosen in the current state analysis with a systematic approach. The two development areas - first, the capacity management process improvement and, second, the implementations of manager roles - are separated into different tracks. The actions for both development areas are divided into three steps, which lead to two output proposals.

For the Capacity management process improvement, there are two workshops conducted and a proposal discussed with the stakeholders, which leads to the output proposal for the improved capacity management process and an updated capacity plan.

For the Implementation of the manager roles, the proposal consists of an implementation workshop, process manager briefing sessions, role definitions and a continuous support plan discussed with the stakeholders.

The proposal for the two areas are presented separately in Sections 7.2 and 7.3 below. Figure 8 also shows that both areas in the proposal included stakeholder involvement in the form of workshops, interviews and briefing sessions (Data 2). The stakeholder inputs are described in the next section.

Figure 8 below shows the logic and action steps in building both proposals.

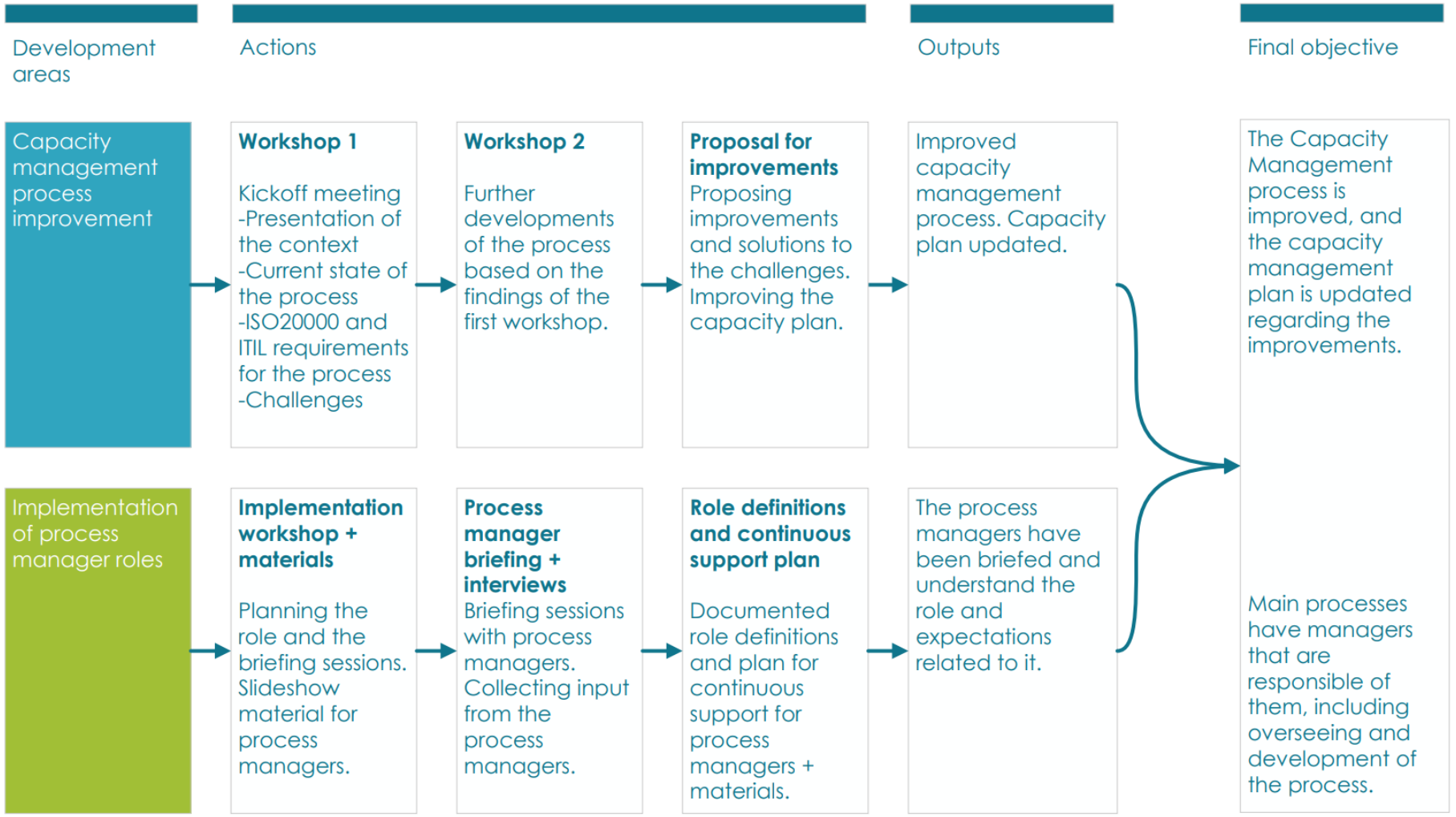


Figure 8. Action steps in the proposal building (with inputs from the stakeholders, Data 2, and output proposals).

7.2 Findings of Data 2 and Proposal for the Capacity Management Process

This section describes the findings (Data 2) related to the capacity management process, and then presents the proposal for the area. Finally, suggestions for next steps are proposed for implementing the suggested process and tool.

7.2.1 Findings Related to the Capacity Management Process

Findings related to the capacity management process improvement (Data 2) were gathered through workshops, discussions and analysis of internal documents. Discussions and reviews of the proposed improvements were carried out with representatives from PMO (Project management office), R&D and Cloud team. Also, the Director of Professional Services provided input for the improvements.

Factors related to capacity were gathered from all stakeholders mentioned above. The factors that were identified are presented in Table 22 below.

Table 22. Factors related to capacity requirements for Efecte Service Management (Data 2).

#	**Factor**	**Additional information**
1	Volume of current tickets	Helps to estimate to “size” or extent of the usage.
2	Size (type) of attachments	Affects the database, since large attachments, such as pictures consume a lot of storage space.
3	Number of licenses (read/write)	Defines the maximum number of users using the system at the same time.
4	Type of solution	The capacity requirements depend on the complexity of the solution.

5	Number of attachments	Number of attachments imported to the system manually or by email.
6	Number and type of integrations	Integrations require instantaneous computing power and memory.
7	Number and type of imports	Import of data require instantaneous computing power and memory.
8	Number of roles	Many roles may require additional computing power and memory. Also, the number of roles describes the complexity of the configuration.
9	Elevated user permission settings (EUP)	The number and length of the EUP chains require a lot computing power and memory.
10	Size of the organization in scope of the solution	May indicate the complexity or size of the solution.

All the factors shown in Table 22 affect the capacity requirements. Although, it is not completely known how much all the factors affect the capacity requirements, it was found that the factors affect the capacity in diverse ways. Some factors, such as the amount of tickets and the percentage of them which have attachments, affects mainly the disk space requirement, while other affect the requirement for computing power and memory.

7.2.2 Proposal for the Capacity Management Process

This part of the proposal provides a solution to the most significant challenge related to the case company's capacity management: the allocation of capacity to new cloud tenants. The relation to ITIL's capacity management process of this improvement is marked with number one in Figure 9 below.

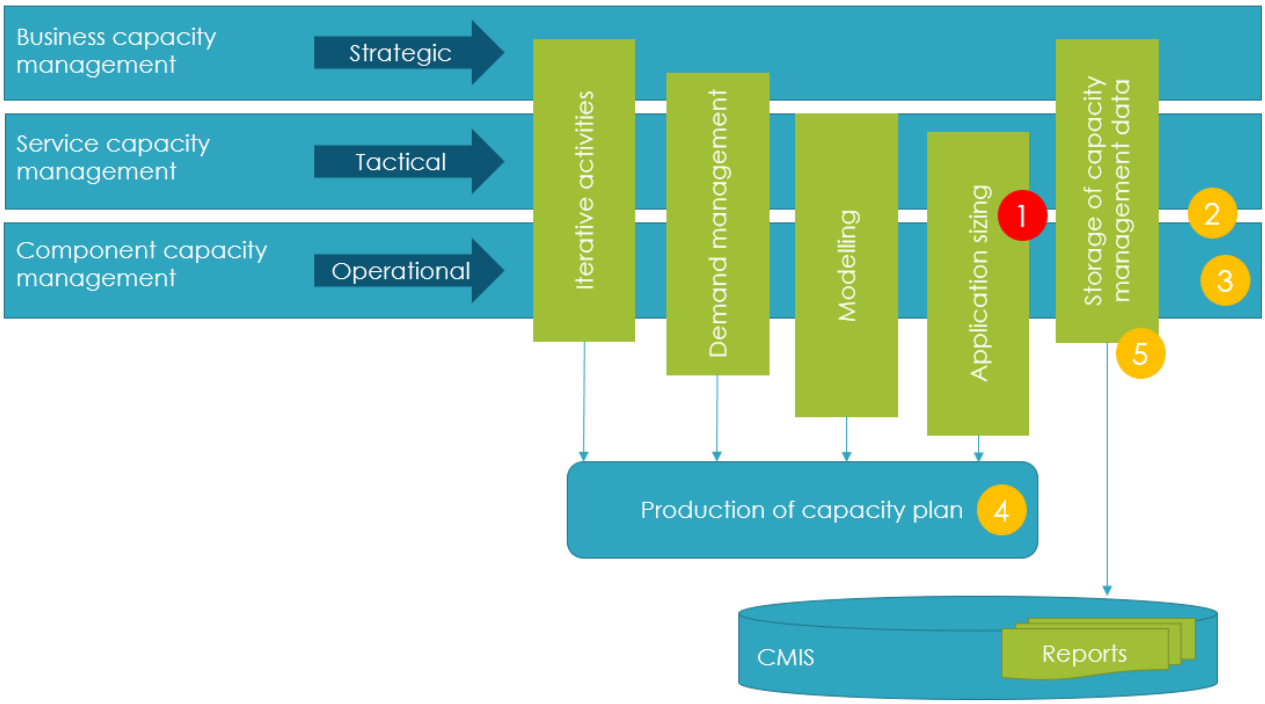


Figure 9. Selected area of development in relation to ITIL capacity management.

The context of the selected improvement area of the capacity management process in shown in Figure 9 above.

Table 23 below shows the other areas of the capacity management process that were found to require improvements. The first item shown in Table 23 was selected to be improved in the proposal. The other areas are not developed in this study, but they are discussed as suggestions for next steps in Section 9.2.

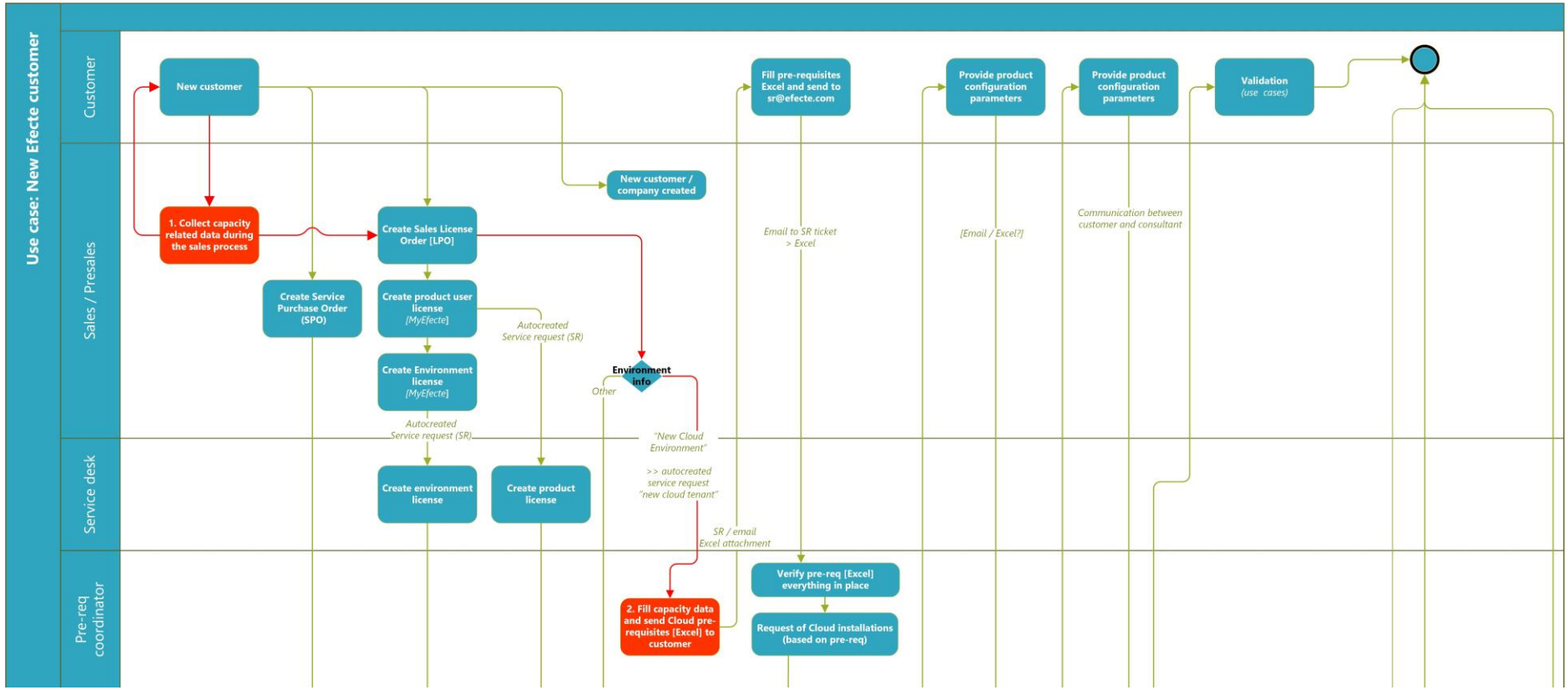
Table 23. Areas recognized to require improvement.

#	**Areas recognized to require improvement**
1	Sizing of new tenants
2	Improving the monitoring
3	Policy to allocate tenants to servers
4	Improving the capacity plan
5	Creating and storing capacity reports

Sizing of new tenants is a capacity management activity, that belongs to the application sizing activity category. The other areas that were found to require improvements are marked with yellow colored dots in Figure 9 above. The other areas are presented in Section 9.2, which discusses suggested next steps for improvement.

Currently, the cloud engineers that install the new customer tenants do not have enough information on how resources, such as computing power, memory and disk space, should be allocated to the tenant. Incorrect sizing of tenants causes incidents frequently, of which the most severe ones have resulted in downtime of customer environments.

To solve this challenge, changes are proposed to be done to the “New customer” process, to enable the collection of capacity requirements. Also, a tool for translating these capacity requirements into specifications is presented, to ensure that the capacity requirements are utilized while installing new cloud tenants. The “New customer” process with the modifications are shown in Figure 10 on the next pages.


Use case: New Efecte customer
Customer
Sales / Presales
Service desk
Pre-req coordinator
New customer
1. Collect capacity related data during the sales process
Create Service Purchase Order (SPO)
Create Sales License Order [LPO]
Create product user license [MyEfecte]
Create Environment license [MyEfecte]
Autocreated Service request (SR)
Create environment license
Create product license
New customer / company created
Environment info
Other
"New Cloud Environment"
>> autocreated service request "new cloud tenant"
SR / email Excel attachment
2. Fill capacity data and send Cloud pre-requisites [Excel] to customer
Fill pre-requisites Excel and send to sr@efecte.com
Email to SR ticket > Excel
Verify pre-req [Excel] everything in place
Request of Cloud installations (based on pre-req)
Provide product configuration parameters
[Email / Excel?]
Provide product configuration parameters
Communication between customer and consultant
Validation (use cases)

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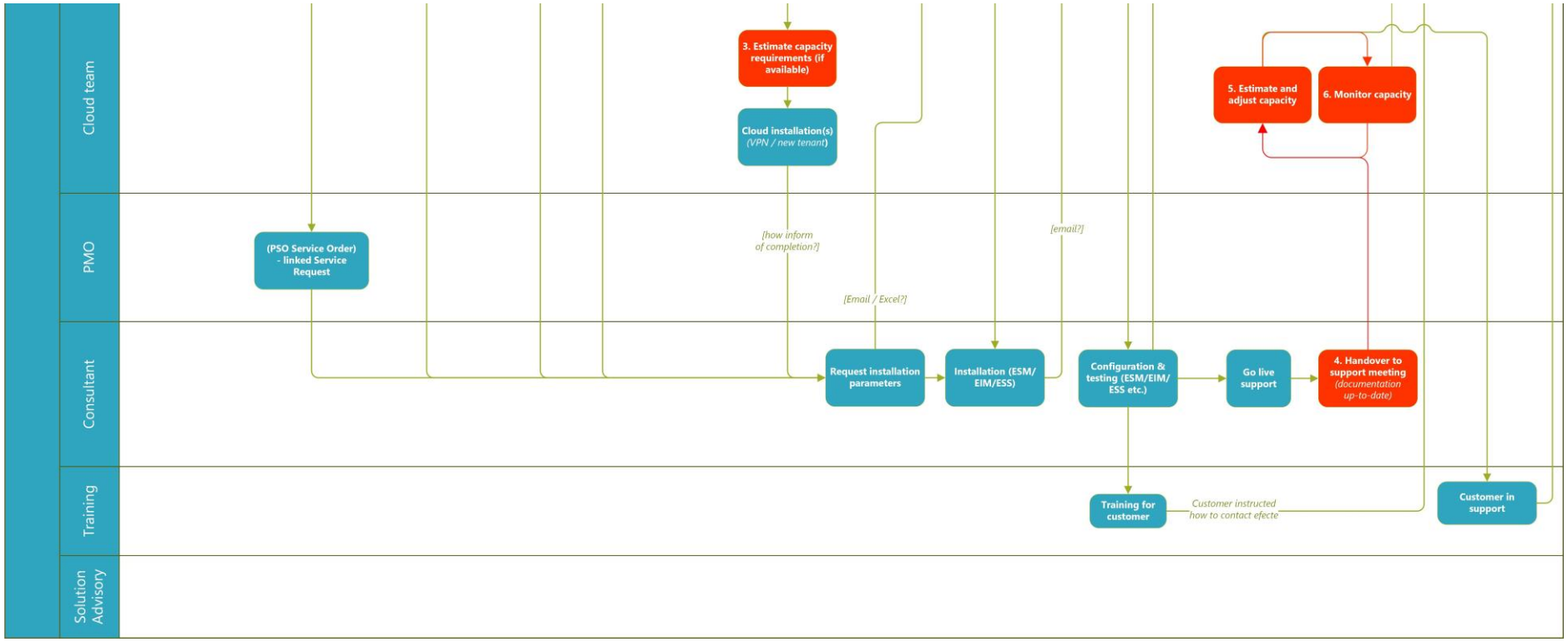

Figure 10. Modified "New customer" process with capacity requirement gathering.

Metropolia

As shown in Figure 10, the proposed capacity related issues are highlighted with red. Capacity requirements are gathered in two phases: during the sales phase, and during the project phase. In the first phase, some preliminary information is gathered by the sales representatives. Capacity requirements that are not available or that do not exist in that phase, are gathered in the second phase, during the project. This process gives an overall view of gathering and translating the capacity requirements to server specifications.

The steps related to capacity management are described in Table 23 below.

Table 24. Process steps for capacity management related activities in the “New customer” process.

#	**Step**	**Details**
1	Gather capacity related data during the sales process	Gathering of capacity requirements from the customer. Mainly the number of licenses and volume of tickets are needed in this phase. The information is put to the LPO order, which includes also other information on the environment.
2	Fill capacity related data to the “pre-req” spreadsheet	A modification to the existing step of preparing the pre-req spreadsheet. In addition to other data, the capacity related data is added to the spreadsheet.
3	Estimate capacity requirements (if available)	The server specifications are estimated by the cloud team, if the requirements are available, by using the new tool presented later in this section. The tenant is installed with the estimated specifications.
4	Handover to support meeting: Provide capacity related requirements to the cloud team	In the end of the project phase the consultants responsible for designing and implementing the solution provides capacity related requirements to the cloud team in the handover meeting.

5	Estimate and adjust capacity	Final capacity requirements are translated to server specifications and the tenant's capacity allocation is adjusted.
6	Monitor capacity	The tenant's capacity is monitored by the cloud team, and the capacity is iterated as needed.

As seen from Table 24, the modifications to the current process are quite straightforward.

First, the process is designed to allow gathering of capacity requirements as soon as possible, to include it in the "pre-req" spreadsheet and keep the capacity information along the process, so that it can be adjusted during the process, as more information on the requirements is found. The stages are designed to allow adjusting the capacity before the production phase is started. Therefore, more accurate specifications are in use from the beginning, and iterative adjustments of capacity is easier.

Second, a possible lack of information before the project phase is taken into consideration in the process. Step 4 ensures that the consultant describes thoroughly the environment's configuration to the cloud team, which allows the cloud team to estimate correct capacity requirements.

Next, the server specifications are estimated by using the tool presented in Appendix 14. The tool is easy to use, since the usage requires only selecting sufficient capacity requirements from the options. The tool suggests guiding values for server specification, based on the capacity requirements. Also, a table for estimating disk space requirements is provided in the tool. The table suggests guiding amounts of disk space, based on two factors: volume of tickets and the percentage of tickets that have attachments. For example, a large ticket volume and a high percentage of tickets that have attachments requires a large amount of disk space.

In addition to creating the tool and making modifications to the process, a process from the cloud team's point of views was made, to communicate clearly the steps that the cloud team is responsible for. The process is shown in Figure 11 below. This process is based on the same steps as the "New customer process", for which improvements are suggested earlier in this section. As this process includes only the steps that are relevant for the cloud team, therefore it can be used as a work instruction for sizing new or existing tenants. The steps 5 and 6 are iterative and should be repeated constantly through the customer tenant's lifecycle, to ensure proper capacity and performance of the customer's application.

Figure 11 demonstrates the steps in the process of sizing the new tenants, presented from cloud team's perspective.

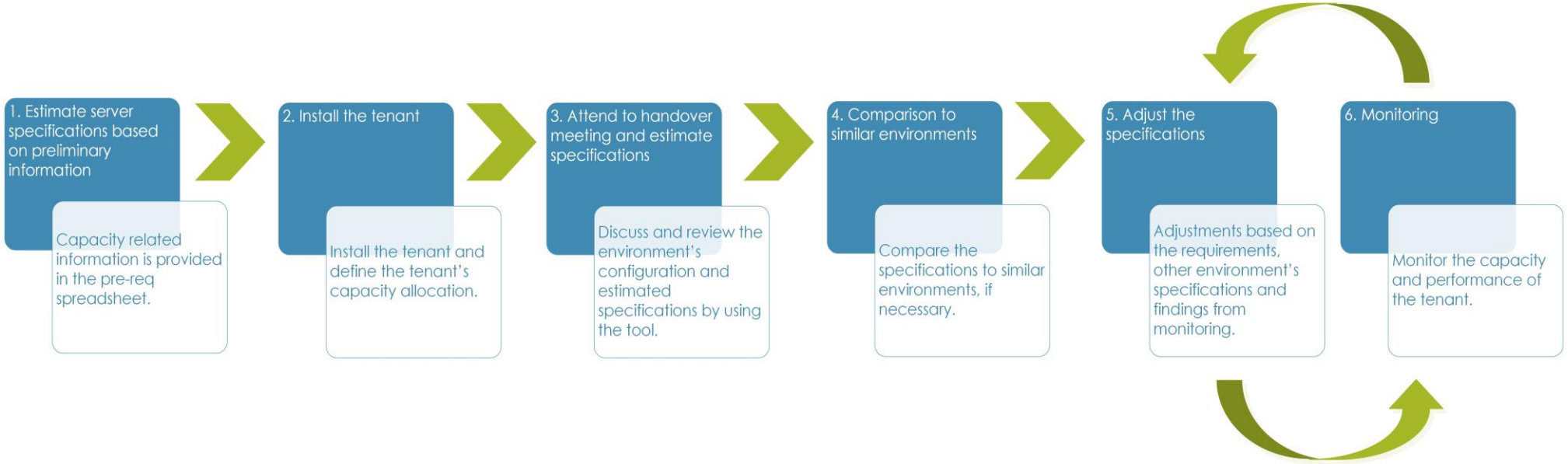

Figure 11. Sizing of new tenants from cloud team's perspective.

Finally, the capacity plan was updated with the proposed improvements. Since the capacity plan is a living document, that should be updated on a regular basis, it was stated that the improvements are suggested, but not yet implemented.

These proposed improvements were described on a general level, without going into details, since the proposal will probably be further developed by the case company, before it is implemented. The validation stage of this study (in Section 8) may also suggest improvements to the proposal. Next steps for implementing and developing the improvements are discussed below.

7.2.3 Suggestions for Next Steps for Implementing and Improving the Sizing of New Tenants

The proposal also included suggestions for next steps for improving and implementing the process of sizing new cloud tenants. The suggested next steps are presented in Table 25 below.

These steps are required to implement the proposed capacity management sub-process successfully. Most of the steps (1–3) are related to establishing a cooperation between the sales, consultants and the cloud team to enable effective gathering and communication of capacity requirements. Step 4–5 are related to the information flow of capacity requirements, and steps 6–7 are related to the cloud team's internal operation. These steps are related to improving the sizing tool and ensuring that necessary actions are made to maintain proper capacity of customer tenants.

Table 25 below shows the suggested next steps for improving and implementing the sizing of new tenants.

Table 25. Suggested next steps for improving and implementing the sizing of new tenants.

#	**Suggested next step**	**Details**
1	Involving sales and presales to gathering of capacity requirements.	To gather capacity information before the project phase of the customer implementation, sales and presales are required to systematically gather capacity requirements from the customer. The requirements must be communicated further to the cloud team, as suggested in the proposed process.
2	Involving the cloud team to handover meetings.	Currently the cloud team members do not attend to the project-to-support handover meeting. Their participation is required by the proposed process, to enable communication of capacity requirements from consultants.
3	Involving consultants of gathering and keeping track of capacity requirements.	Currently consultants know the implemented environment's capacity related factors, but they are suggested to systematically gather the information. The information could be gathered to the tenant sizing tool, or to the environment documentation.
4	Modifications to the LPO and pre-req to support the proposed process.	The license purchase order (LPO) template in MyEfecte is suggested to be modified to include capacity requirements. Optionally, the SOW template cloud be used for the same purpose.
5	Modifying the SOW (statement of work) template to include a section and table for capacity requirements.	The SOW template can optionally be used for gathering capacity requirements from customers.

6	Testing and iterating the proposed tool.	The tool created for sizing cloud tenants would require further testing and iteration by the cloud team. It should be iteratively adjusted continually.
7	Defining ownership of customer tenants for cloud team members.	To ensure proper sizing and monitoring of cloud tenants, ownerships of individual cloud tenants could be defined for cloud team members.

In addition to the suggested next steps, shown in Table 25 above, the organizational change management actions are recommended to ensure a proper implementation. Besides that, communication of the process to all relevant stakeholders is important and highly recommended.

Next, the second part of the proposal is described, the implementation of process manager roles.

7.3 Findings of Data 2 and Implementation of the Process Manager Roles

The proposal for the process manager role implementation consists of three stages: (1) planning the process manager roles and creating materials for the process manager briefing sessions, (2) carrying out the process manager sessions with the case company, and finally (3) defining the roles and making a continuous support plan. The three stages are described in more detail below.

Input for the process manager role implementation was gathered through interviews (Data 2). Section 3.4.1 in the CSA described the status of the process manager roles, but additional comments were gathered by interviews in the proposal building stage. The findings are presented in appendices 12 and 13.

7.3.1 Planning the Process Manager Role and Creating the Briefing Materials

This stage included the workshop for planning the process manager roles and creating of the process manager briefing session material. The workshop was conducted with the ISO 20000 Certification and Development project team.

The role was planned by discussing and creating initial briefing session materials, since the material was going to be used as a general basis for the role definitions. The material was made as a PowerPoint presentation, that addresses the transfer to the governance model with process managers as an organizational change. Models and concepts from the conceptual framework of this study were applied to the material, by presenting the process of change, the content of the change and the people aspect of the change. These areas are shown in Figure 12 below.

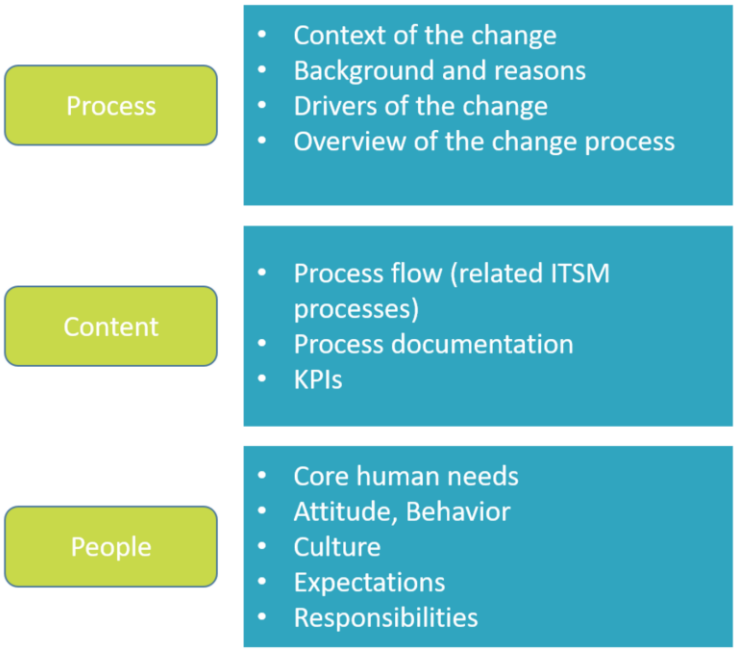

Figure 12. Overview of the content of the briefing session material.

As seen from Figure 12 above, the content of the briefing session materials was made to provide an overview of the three areas. The material was made based on these three areas to provide an understanding of all necessary basic information that the process managers need to fulfil their duties, including the background and human related factors.

The part describing *the process* addresses the process of moving to the current state including other information on the background for implementing the process manager roles. These issues were covered to ensure an understanding of why process managers are needed. *The content* of the change includes the process flow, documentation and KPIs of the relevant ITSM process (Problem management process for the Problem manager, etc.). The last part concerning *the people* addresses human related factors, such as the core human needs including examples related to this case and issues related to attitude, behavior and culture. Also, the expectations and responsibilities were covered briefly in this area, although they were not permanently defined. To make sure that the relevant management of Efecte acknowledges the people related aspects of the change, the material emphasized these issues.

After making this material and reviewing it with the case company, the briefing sessions were conducted.

7.3.2 Conducting the Briefing Sessions and Interviews

In this stage, the briefing sessions were carried out with the ISO 20000 Certification and Development project team. Individual briefing sessions were carried out for each process manager during the same day.

The briefing sessions were based on the pre-made material and open discussion related to the role, but the input was formally not gathered from the process managers due to limited time (45 minutes per process manager). The VP of Services participated to two of four briefing sessions.

After the briefing sessions, the interviews with pre-defined questions were carried out with the SACM manager, Request fulfilment manager and Problem manager. The Change manager was not interviewed, since the person is part of the management and due to participating to the role planning, there was no need to collect additional input.

The interview results are discussed in Appendix 12 and summarized in Appendix 13. The interview results were used as input (Data 2) for the role definitions that was made in the third stage of the proposal for the process manager roles.

7.3.3 Defining the Roles and Developing a Continuous Support Plan

In addition to creating the briefing materials and conducting the briefing sessions for the process managers, a role definition document was made to define and communicate clearly the expectations related to each role.

The content of the document is shown in Figure 13 below.

Figure 13. Contents of the process manager definition document.

As seen from Figure 13, the document specifies, first, *the definitions* for the process manager roles including the authority, responsibilities, tasks, required skills, expertise and finally resources and time allocation. Input from the case company, such as discussions and process manager interviews, were used for making these definitions.

Next, *the continuous support plan* consists of an agenda and schedule for the meetings. The continuous support of the process managers consists of recurring meetings, in which the process managers have a possibility to bring up challenges related to the processes, set and review goals, review of the CSI register (continuous service improvement register) and discuss process related issues. The continuous support meetings of the process managers are going to be held by the Directors of Support and Operations units, and members from the ISO 20000 Certification and Development project is planned also to participate. The support plan includes also a PowerPoint slideshow, that can be used as a template for the upcoming process manager meetings.

The last section of the role definition document describes roles and responsibilities related to *the processes.* To ensure that the process managers understand the responsibilities of other roles and stakeholders using the processes, a RACI matrix was also developed by collecting the input from the case company in discussions. The matrix is based on best practice (ITIL), the case company's input, requirements and structure. The proposed RACI matrix is shown in Figure 14 below.

Process	Incident manager	Problem manager	Request manager	Change manager	Configuration manager	Inf. security manager	Solution Advisory	Service Desk	Cloud Operations	Director of Support	Director of Operations	VP of Services	Efecte Sales	Efecte Products	Efecte Fina	Efecte Management team
Incident management	R	I					R/C	R		A				C		
Problem management	I	R					R/C	R		A				C		
Service request fulfillment			R	I			R/C	R		A						
Change management				R		C	R/C	R		A						
Release and deployment management				R/A	I	C	C	C	C		C			C		
Service level management	C	C	C	C	C			C		R		A	C			
Capacity management		C/I			C		C	C	R	I	R/A			C		
Service asset configuration management					R		R	R	R	I	A					
Design transition new changed services				C			C/I	C/I	R	R	R	R/A		R		
Continuity availability management	C					C			R	R	R/A			C		C/I
Budgeting and accounting of services										R	R	R/A			R	C/I
Business relationship management										R	R	R	R/A			R
Supplier management									C	R	R	A			C	I
Service reporting										R	R	A				
Information security management	C	C				R			C		C	A		C		I

Figure 13. RACI matrix with relevant stakeholders and processes.

8 Validation of the Proposal

This section describes the validation stage of the initial proposals developed in the previous section. First, an overview of the validation stage is presented, after which the validation of the proposal for improving the capacity management process is described. Finally, the validation of the process manager role definition is described.

8.1 Overview of the Validation Stage

The validation stage of this study presented the proposals to the case company, gathered feedback and made further developments to the proposals. The proposal building stage presented in the previous section was carried out in close cooperation with the case company, and the developments were iterated multiple times, based on input from relevant stakeholders. Therefore, the proposals base on the case company's requirements and expectations, and the validation stage strived to make final improvements to the proposals.

The proposal in this study consists of two separate parts, which were both validated in different forums. The proposal related to the capacity management process improvement was validated with the Director of Support and Director of Operations. The proposal regarding the process manager role implementation included actions that were carried out in practice, and therefore only the document related to the process manager role definitions, including the continuous support plan, was validated in this stage. Next sub-sections discuss further developments to the capacity management process and the manager role implementation.

8.2 Further Developments to the Capacity Management Process

The part of the proposal related to capacity management was successfully validated through a validation workshop with the Director of Support and Director of Operations. The Director of Operations, to whose responsibilities capacity management belongs, stated that the proposal will be implemented, since it solves significant challenges related to customer tenant's capacity. Further developments that came up in the workshop are presented in this section. The further developments are summarized in Table 26 below.

Table 26. Further developments to the capacity management proposal.

#	**Development to the proposal**	**Details**
1	Initial estimation of preliminary capacity information by using a scale from XS to XL.	Modification of the process for gathering capacity requirements. Classifying required capacity based on preliminary information based on the following scale: XS, S, M, L, XL. The scale would relate to the options in the capacity planner tool. Adding the scale to the capacity planner tool.
2	Using the Installation card in MyEfecte for storing capacity related information	Capacity related information would be filled and stored in the Installation datacard. Possibly automatic creation of installation datacard in MyEfecte.
3	Defining ownership of the capacity planner tool	An owner for the proposed capacity planner tool should be defined, to ensure continuous maintenance and improvement of the tool.

As seen from Table 26, the first development to the proposal strives to ensure that the preliminary information is estimated easily. Categorization by using a common scale helps to remember the various levels of capacity requirements, and therefore it helps to make estimates on the capacity requirements.

The second development is related to the information flow of capacity requirements. The installation cards for are used for storing general information of cloud tenants, and therefore it would be the most suitable place also for capacity related information.

The third development to the proposal can be seen as an addition to the proposal's next steps. Since the proposed capacity planner tool requires constant iteration. This can be achieved by defining an owner to the tool. The owner would be responsible for iterating and developing the tool. The scoring of capacity parameters can be adjusted as the knowledge and experience of how the parameters affect the requirements for server specifications. Next, the validation of the process manager role definition is presented.

8.3 Further Developments to the Process Manager Role Implementation

The process manager role definition document was validated through a validation workshop with the VP of Services. The findings from the validation were minor and were immediately put to practice by editing the definition document. Changes were proposed to the sections describing the responsibilities and required skills and expertise of the process managers.

Regarding the responsibilities, the definition related to management of resources of processes was changed to cover only process work, opposed to management of resources for the process itself. The required skills and expertise section was slightly modified to suit general requirements of process managers at the case company.

The most significant changes in the validation related to the definition of roles and responsibilities on the process level, as shown in Figure 15 below.

Process	Incident manager	Problem manager	Request manager	Change manager	Configuration manager	Inf. security manager	Solution Advisory	Service Desk	Cloud Operations	Director of Support	Director of Operations	VP of Services	Efecte Sales	Efecte Products	Efecte Fina	Efecte Management team
Incident management	A/R	I/C	C	I	C	C	R/C	R	C	CA	C	I	I	C	I	
Problem management	CI	A/R		C	C	C	R/C	CR	C	CA	C	I	I	C		
Service request fulfillment	C		A/R	CI	C	C	R/C	R/C	R/C	CA	C	I	I		C	
Change management	C	C	C	A/R	C	C	R/C	R/C	R/C	CA	C	I	I	C	C	
Release and deployment management				R/A	I	C	C	C	C		C	I		C		
Service level management	C	C	C	C	C			C		R	R	AA	C	I		
Capacity management		C/I			C		C	C	R	I	R/A	C		C	I	
Service asset configuration management					R		R	R	R	RI	A/R					
Design and transition of new or changed services				C			C/I	C/I	R	R	R	R/A		R		
Continuity and availability management	C					C			R	R	R/A			C		C/I
Budgeting and accounting of services										R	R	R/A			R	C/I
Business relationship management							R	R		R	R	R	R/A			R
Supplier management								R	C	R	R	A			C	I
Service reporting	R	R	R	R	R	R		R		R	R	A				
Information security management	C	C				R			C		C	A		C		I

Figure 14. Changes (marked with blue) to the RACI matrix.

As seen from Figure 15, the responsibilities of nearly all processes were modified, but the incident management, problem management, service request fulfillment and change management responsibilities faced most modifications. The modifications were mainly related to making more roles consulted and informed of the previously mentioned processes. The definitive version of the RACI matrix is provided in Appendix 16.

The changes to the proposals were carried out in the validation stage. The final proposals are bases on the initial proposals, including changes done in the validation stage. Next, the summary and conclusions to the study are presented.

9 Summary and Conclusions

This section summarizes the study and provides final conclusions. First, an executive summary is provided. The summary provides an overview of the study, starting from the business context and business challenge to the implemented and proposed actions. After presenting the actions, the study is evaluated against the initial objectives, with some final words at the end.

9.1 Executive Summary

This study focuses on developing the case company's operations towards the requirements set by the ISO/IEC 20000 standard. This study is part of the ongoing ISO 20000 Certification and Development project executed in the case company. The ISO 20000 standard ensures functional processes and efficient delivery of services, and therefore compliance with this standard has significant value for the case company.

The objective of this study was to create a plan and develop the case company's operations to match closer with ISO 20000 requirements. The selected approach was, first, to investigate the current status of the project and the case company's processes, and then select areas to develop. The areas selected for improvement were the capacity management process and the process manager roles. The current state analysis is discussed in Section 3 of this study.

The study was conducted in seven stages using the R&D research tool developed by Industrial Management, Metropolia. The study is based on a structured research process that investigates the challenges of the current state, seeks important inputs from literature and best practice and produces a proposal in close cooperation with the company stakeholders. The company stakeholders were involved in all stages of the study, through numerous interviews, workshops and discussions. The research design is discussed in Section 2.1.

The key findings of the capacity management process were related to the process of sizing the new tenants. Previously, there was no process for gathering business requirements and translating them into capacity requirements, so that the cloud operations could use them for installing the new cloud tenants with proper capacity. At the same time, it was found that other capacity management practices are utilized by the cloud team, which has an open attitude towards improvements. Findings related to the capacity management process are discussed in Section 7.2.1. In addition, key findings regarding the process manager roles related to uncertainty with the roles, responsibilities, authorities and expectations by the newly appointed managers. But it was also found that the implementation

of the roles had started, and that the process managers already perform some of the process manager role activities. Findings related to the process manager roles are discussed in Section 7.3.1.

The study generated, first, the proposal for the capacity management process, and second, the actions related to the implementation of the process manager roles. The capacity management proposal consists of (a) a process for gathering the capacity related requirements from customers and consultants, (b) a tool for translating the capacity requirements to technical specifications, and (c) a work instruction process for the cloud team. The capacity management process proposal includes also suggestions for next steps for implementing these proposals (Section 7.2.3).

For implementing the process manager roles, actions such as (a) briefing sessions, (b) workshops and (c) interviews were proposed and carried out. Also, (d) a role definition document was created, to clearly communicate roles, responsibilities, authorities and expectations related to processes and roles. Finally, (e) a continuous support plan for the process manager roles was also made. These proposals strive to support the process managers by allowing discussions, mitigation of challenges and setting goals on a regular basis. The process manager role implementation is discussed in Section 7.3.

The proposed improvement for the capacity management process, and the proposed process manager role definitions were successfully validated by the case company. Further developments were identified in the validation workshops with the VP of Services, Director of Support and Director of Operations. The proposed processes and definitions were developed based on the important feedback of the stakeholders. The validation stage of this study is discussed in Section 8.

When discussing the business impacts for the company, an effective and functional capacity management process ensures that the capacity of IT services allows service delivery that meets the agreed service level targets. The process for sizing new tenants based on customer requirements is part of that, since it ensures that customer tenants are equipped with proper capacity, which strives to ensure better performance and availability, including fewer capacity related incidents. This ultimately leads to improved customer satisfaction.

Also, using a governance model with process managers helps the case company to manage processes according to the requirements set by the ISO/IEC 20000 standard, which the case company will soon acquire. The process manager role implementation and role definition that were generated by this study help to provide the process managers with a complete package of information needed for starting their work as process managers. By supporting the process managers in their work and

making the organization commit to working per the new roles and responsibilities, the existing processes can be developed further, and new processes can be implemented. Thus, effective service management processes ultimately lead to more efficient operations and improved profitability, including many other benefits.

9.2 Next Steps and Tips for Implementation of the Proposal

The suggestions for next stapes are based on findings from the current state analysis and the proposal building stage. Regarding the capacity management process, the CSA identified 5 areas requiring development, of which the first one was addressed in the proposal. The areas are shown in the table below.

Table 27. Suggestions for next steps for improving the capacity management process.

#	**Suggestion for next steps**	**Details**
1	Sizing of new tenants	Addressed in the proposal.
2	Improving the monitoring	Adjustment of thresholds and settings of PRTG monitoring software.
3	Policy to allocate tenants to servers	Creating a policy for allocating tenants to virtual servers, to ensure that not too capacity consuming tenants are ran on same virtual servers.
4	Improving the capacity plan	Improving the plan to completely fit to current operations.
5	Creating and storing capacity reports	Creating a process for storing capacity reports, potentially by exporting reports to SharePoint or another feasible destination.

The suggestions for next steps relate to the improvements for the other areas 2-5. By improving the suggested areas, the capacity management of the case company would improve significantly, which would directly improve the capacity and performance of customer tenants. Customer tenants equipped with proper capacity, can affect the customer satisfaction in a positive manner, due to good performance and reduced incidents and downtime. Most of the suggested improvements would be quite straightforward to plan and implement.

Regarding the process manager roles, the next steps in implementation would probably require additional attention to two main areas summarized in Table 28 below.

Table 28. Suggestions for next steps for the process manager roles implementation.

#	**Suggestion for next steps**	**Details**
1	Communicating the role definitions to the process managers	The process manager role definition document can be presented and discussed with the process managers, to ensure that the managers have enough information needed for working in the role.
2	Ensuring that the process managers have the possibility to allocate time for managing the processes	Investigating and finding solutions to the high workload of the Support and Operations unit.

As shown in Table 28, the next steps point to (1) communicating the role definitions to the process managers and (2) ensuring that the process managers have the possibility to allocate time for managing the processes. Models and processes of organizational change management, explored in this study, also recommend leveraging the extensive process of moving to the governance model with process managers. Also, investigating root causes for the workload in the Support and Operations units is recommended, to ensure that the process managers and other employees have a possibility to use and continuously improve the processes.

9.3 Thesis Evaluation: Objective vs. Results

This study's objective was to improve the capacity management processes and the process manager roles based on the needs defined by the current state of the ISO 20000 Certification and Development project in the case company. The study strives to achieve this by making a current state analysis, gathering best practice from literature and making a plan for the development actions, before implementing the proposal. The proposal consists of two parts, of which the first proposes an improved process for sizing of tenants. This part relates to an important part of the case company's capacity management process. The customer tenant's capacity is critical to the business, since it affects directly customer satisfaction and service level agreements between the case company and its customers. Even though the objective of improving the capacity management process can be seen as met, it is worth mentioning that the capacity management process consists of many other sub-processes and actions, which require improvements or implementation prior to the audits. Due

to the recommended extent and effort for the study, all parts of the capacity management process were not improved.

The second part of the proposal strives to improve the process manager roles by defining the roles and responsibilities. Additionally, actions done during the study (process manager briefing sessions) strived to improve the roles. In spite of the actions and suggested definitions of the roles and responsibilities, additional effort and repeated actions are probably required for a complete implementation of the process manager roles – the proposal of this study provides a start for the implementation of the roles.

To conclude, the objectives of the study can partially be seen as met, but it is worth noting that the objectives of improving the capacity management process and implementing process manager roles are rather ambitious.

9.4 Final Words

Achieving a certification that covers several processes and developing operations in parallel with daily production of services is certainly demanding for any organization. Thus, the case company is now slightly closer to the ISO/IEC 20000 certification and has potentially better prerequisites for developing its processes further.

This study focused on developing the case company's operations towards the ISO/IEC 20000 certification by improving selected areas. The capacity management process and the process manager roles were placed in focus of this study, to ensure further development of the case company's processes. The development efforts seemed to lead to actual improvements, and the case company seem to be satisfied with the results.

Making this study was an extensively learning experience that provided the author with a broad view on a cloud-based SaaS company's process governance, process management, operations and internal development activities. As such, this study went beyond a school assignment and resulted in valuable outcome that can be used by the case company. This study has also opened the way to the author's further professional endeavors and he would like to sincerely thank the case company for this opportunity to develop its operations regarding real-life business challenges.

9.5 Final evaluation from the case company

Timo Hyvönen, Vice President of Professional Services and Operations at Efecte evaluated this theses in the following words: "Jonne Kauko has researched an area of wide industry interest: the process way of working in a cloud service company. Focus has been set to processes, people and tools – in this order. Findings at all areas are well valid and support Efecte development efforts towards ISO 20000 certification. Process manager interviews reveal the fact that management support and adequate time allocation are the most important areas for successful process development. I would like to thank Jonne Kauko for this high quality and practical thesis work. It was accomplished timely and serves the purpose of company development well."

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Appendix 1: Thesis plan

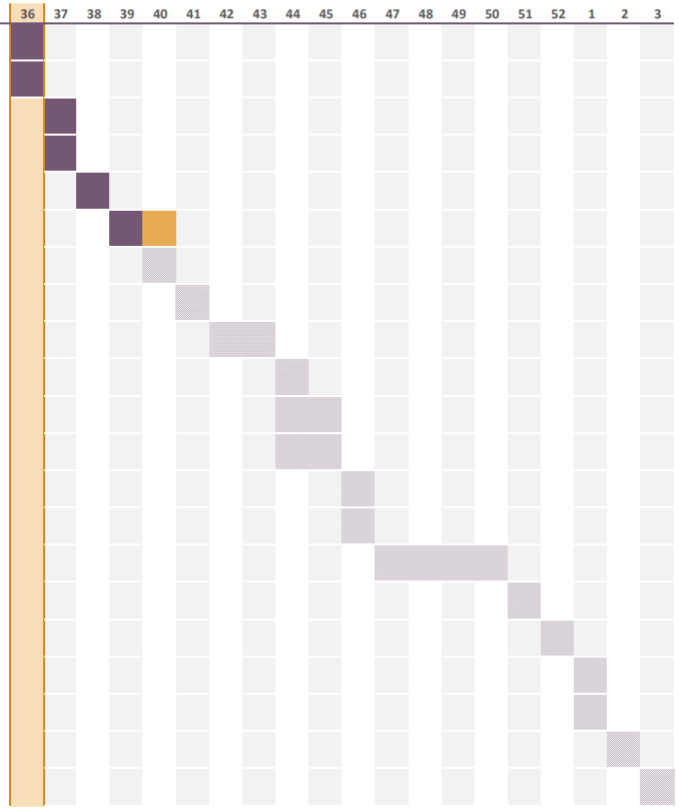
Thesis plan: ISO/IEC 20000 Certification for A Cloud SaaS Provider

Jonne Kauko

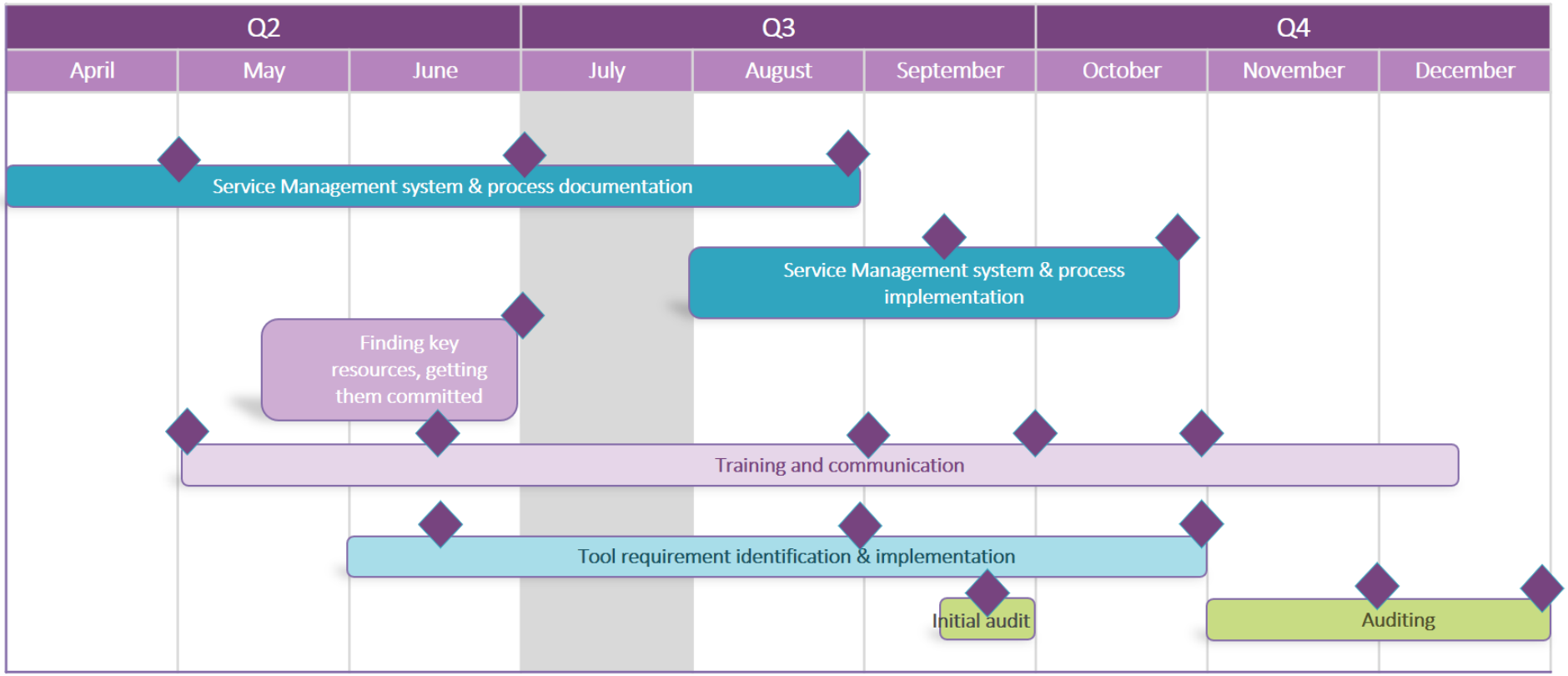
Period Highlight: 36

Plan Duration | Actual Start | % Complete | Actual (beyond plan) | % Complete (beyond plan)

GATE	ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
-	Kick-off meeting	36	1	36	1	100 %
-	Confirm thesis scope with Nina	36	1	36	1	100 %
-	ISO20000 pre evaluation	37	1	37	1	100 %
1	Write Gate 1	37	1	37	1	100 %
2	Plan Gate 2	38	1	38	1	100 %
2	Write Gate 2	39	1	39	2	100 %
1, 2	Make corrections to Gate 1 & 2	40	1			
3	Plan Gate 3	41	1			
3	Write Gate 3	42	2			
3	Make corrections to Gate 3	44	1			
4	Plan Gate 4 & read	44	2			
4	Write Gate 4	44	2			
4	Make corrections to Gate 4	46	1			
5	Plan Gate 5	46	1			
5	Write Gate 5	47	4			
5	Make corrections to Gate 5	51	1			
5	Present Gate 5 to Efecte	52	1			
6	Write Gate 6	1	1			
6	Make corrections to Gate 6	1	1			
7	Write Gate 7	2	1			
7	Final polish and hand-in	3	1			



Appendix 2: ISO 20000 Certification and Development project plan: Overview



Appendix 3: Interview field notes for CSA – Efecte CEO

Interview field notes
Interviewee: Sakari Suhonen, CEO
Date and time: 15.09.2017 10:00-10:30

Question	Answer
1. How is Efecte positioned on the Finnish market?	Efecte is the market leader with its over 200 customers.
2. How is Efecte positioned on the international (Nordic) market?	Efecte is the larger vendor in the Nordics, measured by revenue.
3. What are Efecte's main competitors in the Nordics?	There are two main competitors in Sweden, Nilex and Easit. The companies are larger measured by their revenue, but over half of their revenue is generated from Java consulting.

Appendix 4: Interview field notes for CSA – Project manager

Interview field notes
Interviewee: Milla Kuosmanen, ISO 20000 project manager
Date and time: 3.10.2017 13:00-13:30

Question	Answer
1. How would you describe the current situation of the certification project, with the following categorization	• The current schedule is challenging • More resources would be needed
1. a. People	• Process managers are nominated: Incident manager, problem manager, SACM manager, change manager • Process manager's responsibilities and the role in general, are still not implemented. The title is given, but the persons do not yet have enough information on the responsibilities and what is expected from them. There is risk that they do not have enough time for the role. • ITIL knowledge is weak, foundation level training would be preferable • Time for the organisational change management should be also arranged
1. a. 1. What should be done to fix the challenges?	• Basic ITIL training for all operations people, some expert modules for process managers and • Maybe also Director of PSO -> Service transitions course, Director of Support & Operations -> Service operations course • Time should be arranged for the process managers to adapt the new role • One option is to have internal coach and/or forum, to mentor the process managers. It would be a role like a "Scrum master", as the R&D department has. • The process manager should define the metrics for his/her own role o The process manager should follow the metrics, and develop the process according to the metrics • Organizational change management would not be needed as much as now, if the process managers would feel that they own the process, and would work to improve the processes. • It would be best to have process managers participating in the project to avoid the gap between project and operations.
1. b. Processes	The pre-evaluation results did describe the current strengths and weaknesses well.
1. b. 1. What should be done to fix the challenges?	• Process manager roles need to be implemented properly to ensure proper results • Define and follow process metrics from the start • Configuration Manager has competence and good plan but not enough time for the implementation. • Problems (in the sense of ITSM) are not managed in an active and proactive manner o The current problems are potentially seen just as tickets in the system o The implementation of the process has not been enough comprehensive
1. c. Tools	The main tool (MyEfecte) supports processes on some level, at some point of time it would be good to clear unnecessary functionalities. Many people can make changes to MyEfecte.
1. c. 1. What should be done to fix the challenges?	MyEfecte ownership and approval of changes should be done by one person (consultant). The process managers should also participate and cooperate with this “MyEfecte consultant”, to develop their own area of responsibility.
2. How would you prioritize the upcoming development?	1. Trainings & process manager coaching 2. MyEfecte ownership & change management
3. What about organizational change management? What should be done to implement the processes better?	There should be more clear plan how processes are implemented.

Appendix 5: Interview field notes for CSA – Configuration manager

Interview field notes
Interviewee: Configuration manager
Date and time: 20.10.2017 10:00-11:00

Question: what is the current status of the configuration management processes compared to the ISO 20000 requirements listed below? D stands for Document, R for record.	**Answer**
1. General question: How would you describe the current situation of the CMDB, compared to the requirements?	• The current situation of the CMDB is that it's not established. The theoretical aspect (documentation) is in work in progress stage. • The practical part of the process has not been implemented. All the current data in MyEfecte is not maintained, and there is not a managed process for maintaining the data. • Work instructions has been made for the following CIs: Installation server, ESM Installation and EIM Installation.
2. There shall be a documented definition of each type of CI. D	The types are partially defined. The status of the development in this area depends partially on how Efecte's services will be defined, and if there is one or more classes of services. The services should be in the CMDB.
3. The information recorded for each CI shall ensure effective control and include at least:	-
a) description of the CI; D	Common attributes and relationships are defined in the documentation, mut they are not implemented in the system. General attributes are also defined in documentation. These exists in the system, excluding the status, which is not recorded currently. Some challenges with the status types (status: old). It has not been clearly defined what is included in the CMDB. Common platform and Server CIs are not described yet. Service level attributes and office attributes has not been defined. The workstation (office) CI records should be also posessed by Efecte, since it would be necessary to have information of the current workstation in case of changing the supplier. The current CMDB documentation is the best guess of what should be included in the CMDB, but the content should be reviewed.
b) relationship(s) between the CI and other CIs; D	The relationships has been defined in the documentation. The linkages does not exist in MyEfecte.
c) relationship(s) between the CI and service components; D	Theoretically the relationship between CIs and service components is defined on a very high level, but not in practice and possibly not on a required level. Internal service components are defined, but they are not in the MyEfecte tool. The current state and relation between the CMDB and the service catalogues is not completely clear.
d) status; D	In some CIs there is a status field. The status types should be defined better in the system (old -> retired). The data is not up to date in the system, since it is not maintained. A review of the statuses should be done, and a process for maintaining the data should be implemented.
e) version; D	The versions exists in the documentation, but it's unclear if the versions are documented accurately in MyEfecte.
f) location; D	The location is a challenge since the services are mostly ran in the cloud. It's not possibly necessary to maintain the location information. Also, the on-premise installations are managed by the customers, and therefore the information is possibly not relevant to Efecte.
g) associated requests for change; D	These are defined in the documentation, but not in practise.
h) associated problems and known errors. D	These are defined in the documentation, but not in practise. There's not possibly a field in problem template. The relationship between CIs, problems, incidents, and KB articles and known errors should be established. The linkage to CIs should be same for all these previously mentioned templates.
4. CIs shall be uniquely identified and recorded in a CMDB. R	Exists in the documentation. Due to the fact that the CIs are not systematically maintained in the system, some challenges will occur. The CIs that has been maintained in the CMDB is supposed to be OK at the moment, but the one's that has not been maintained, does not exists and are not identified.
5. There shall be a documented procedure for recording, controlling and tracking versions of Cis	There are work instructions for some CIs. The controlling has been defined only in the documentation. The tracking is supposed to work in MyEfecte currently.
6. Where deficiencies are found, the service provider shall take necessary actions and report on the actions taken.	The responsibilities are defined in the documentation. The responsibility forces the responsible (or accountable) person to track the deficiencies and take necessary actions. This is defined in the process documentation, but this concept has not been established.
7. Changes to CIs shall be traceable and auditable to ensure integrity of the CIs and the data in the CMDB.	MyEfecte supports this.

Appendix 6: Interview field notes for CSA – VP of Services

Interview field notes
Interviewee: Timo Hyvönen, VP of Services
Date and time: 20.10.2017 14:00-14:30

#	Question	Answer
1	The biggest challenges may be related to the fact that the reality differs from the documentation. What should be done to implement the processes better?	Processes exists, but the documentation is missing. Matching the operations to match with the documentation. Problem management has been established, but the process is not completely implemented. Change management has existed, but not in the context of cloud instances. The cloud business is new for the company and changes to cloud environments or architecture has not been tracked and managed. Change management process will be implemented by developing the tool, it will be built to facilitate the process. There has not been a direct need for control processes. Earlier, when the company was small, there was no need for all processes. Also, the competence of the employees have affected this issues. The background of many employees have been related to working with servers (on the infrastructure level). This kind of persons does not typically work with these processes.
2	What about organizational change management? What should be considered while making this kind of project?	More training and presentations. The employees should also have more ITIL process knowledge. The responsibility of implementing the processes should be in the line management.
3	What is the background and current state of the CMDB and the Configuration management process?	Efecte's CMDB has (in the on-premise time) included customer information, software information and information on which platform the customer's installation runs on. Currently a lot of relations are missing, but the data model has been planned. In the times when on-premise installations were used, the configuration files were stored in the application database, which could be used by the support. The Configuration management process has not been managed and responsibilities have not been defined properly. It must be clarified if we are going to set up a complete CMDB of internal assets, or just assets related to customer installations.
4	What is the background and current status of Supplier management processes?	Some kind of supplier management process activities have existed, like agreements cooperations related to the production. Continuous cooperation management has been established, but this process is in an initial state currently.
5	What is the current status and background of the Business relationship management process?	In this area of business, the operations are not directly in contact with the customers regarding these matters, the only contact point operations and Efecte is between the production and the customer's admin user. A need for a managed business relationship management processes has not been recognized, since the Sales department handles this. Anyway, the process conmmunication has been bad. The customer has received a message just when the ticket has been opened and closed, but no statuses and estimates have been delivered to customers.
6	What is the background and current status of the Service delivery processes?	The day to day operations have required some of these processes, like capacity management. Though, the processes have not been managed and defined, and they have been quite informal.
7	What is the background and current status of the Resolution processes?	The business has required these processes. Solving incidents and fulfilling service requests are part of the main business, and the tool has supported this. Also, ITILs way of working with incidents corresponds to a natural way of working. This is possibly why the processess has been praticed in a manner that's somewhat close to ITIL. The processes has anyway not completely been aligned with ITIL so far, but adjustments has been done regarding the priorization and categorization to match the current templates configuration with ITIL. The maturity level of the incident management processes could be level 2 in the CMMI model.
8	What is the background and current status of the Release processes?	A Release management processess related to the production of services has not been practiced according to ISO 20000 requirements before the certification project. Currently a production related Release management processes exists. The R&D -department publishes software release builds, but that is not the same as releases related to production. The test cycle practiced by R&D has interfered with the Release management process. Currently, release schedules have been established and the process exists.
9	How would you prioritize the upcoming development?	Incident management and change management first, including release management. Problem management after these. Capacity management after problem management. The rest of the processes after these.

Appendix 7: Types of organizational change (by Anderson & Anderson, 2010a)

The three types of organizational change by Anderson & Anderson (2010a, pp. 51-64) are presented in the table below.

#	**Type of change**	**Details**
1	Developmental change	Improvements of something already known or practiced. Occurs through training, process improvement, communications or skill development.
2	Transitional change	Transition from an old state to a new state. Replacing the old with something different. Reorganizations, mergers or consolidations, installation of latest technology, creation of new products etc.
3	Transformational change	A radical shift of structure, strategy, processes, systems or technology, that requires a shift of mindset, culture and behavior.

The developmental and transitional change are similar in the manner that the outcome is clear in the beginning, the impact on the mindset is small and the level of personal development required is relatively small regarding both, although transitional change may require slightly more personal development than the developmental change. These types of changes are usually possible to control, and the "degree of pain" felt by the targets of the change is usually relatively low, as opposed to the third type, transformational change. In this type, the outcome is not necessarily well known, and since the change may be radical, the "degree of pain" felt by the targets of the change can be relatively high. Also, the transformational change may be nonlinear, which means that multiple iterations and adjustments may be required during the change process, which may increase the "degree of pain" felt. (Anderson & Anderson 2010a, pp. 51-64.)

Appendix 8: Common change processes

Kotter's and Lewin's change model steps. (Kotter, 1996, p. 21; Lewin, 1952, cited by Elearn, 2007, p. 62.) are presented in the table below.

# *	Kotter's change model steps	Lewin's change model steps	# **
1	Establishing a sense of urgency	Unfreezing the present level	1
2	Creating the guiding coalition		
3	Developing a vision and strategy		
4	Communication the change vision		
5	Empowering broad-based action	Moving to the new level	2
6	Generating short term wins		
7	Consolidating gains and producing more change		
8	Anchoring new approaches in the culture	Re-freezing that new level	3

* Kotter's process step numbers

** Lewin's process step numbers

As seen from the table above, the change process suggested by Lewin is far simpler than Kotter's 8-step process. There can still be found a linkage between the steps, as suggested in the table above. The unfreezing of the present level would correspond to Kotter's steps 1 to 4, which are related to prepare the upcoming change, by gathering right people to participate in the change effort, planning it and communicating it. Kotter's steps 5–7 are all about implementing the change, by making the actual change effort while generating short term wins and finally reinforcing the change. These steps correspond to Lewin's 2nd step. The last step in both models strive to make the change last, by freezing the achieved state by influencing the culture. (Kotter, 1996, pp. 20-23); Elearn, 2007, pp. 62-64.) Elearn (2007, pp. 64) suggests that the re-freezing could include i.a. celebrating the success, leading by example and supporting and rewarding the employees. These actions are suggested to be included in the change models, to prevent the organization to slip back to the initial state. Next, lets discuss resistance of change, and how to overcome it.

Appendix 9: Further discussion on personal compacts

The personal compacts are “reciprocal obligations and mutual commitments”, which can be stated and implied. The *personal compacts* should be redefined while planning and implementing change initiatives, to minimize and overcome resistance. To redefine the personal compacts, the leaders should take these steps found in the table below.

Table 16: Steps to redefine the *personal compacts* according to Collins & Porras et al. (1998, p. 149).

#	**Steps to redefine the *personal compacts***
1	Leaders draw attention to the need to change and establish the context for revising compacts
2	Initiate a process in which employees can revise and buy into new compact terms
3	Lock in commitments with new formal and informal rules

Collins & Porras et al. suggest that by approaching these phases in a systematic manner can help achieving better results in change initiatives. These steps are needed to create links between the employees’ commitments and the necessary change outcomes. (Collins & Porras et al., 1998, p. 149.) Redefining the *personal compacts* discussed in this section, could help the employees of any company to understand simply what is expected from them and what the organization commits to, while transitioning to a new state during an organizational change. Needless to say, this could lead to smaller resistance of change.

Resistance can also be caused because of various positions and perspectives, that are not noticed or considered while planning and leading change initiatives. According to Collins & Porras et al. (1998, pp. 139-141), executives and employees see the change differently, which can cause difficulties in implementing the change – often because of resistance. Executives may view the change as an opportunity to improve the business in many aspects, while employees and middle managers may perceive the change as intrusive and disruptive. To avoid this, the Collins & Porras et al. suggests that

the executives should simply put themselves into the employees' shoes while planning and leading the change.

By considering the human dynamics of change, including the core human needs and the *personal compacts,* it may be easier to achieve successful change in organizations, due to less resistance. Other aspects and issues to consider while leading change is discussed in the next section, including discussion on key focus areas and common mistakes.

Appendix 10: Common mistakes in leading major change (defined by Kotter, 1996)

Common mistakes in leading major change (defined by Kotter, 1996, pp. 4-14) are presented in the table below.

#	Common mistakes	Explanation
1	Allowing too much complacency	Not creating enough "sense of urgency", i.e. not allowing the organization to see clearly enough that there are important challenges to deal with.
2	Failing to create a sufficiently powerful coalition	Failing to gather a group that has influential members (such as executive managers), that has the power to make decisions, support the change and influence the organization.
3	Underestimating the power of vision	Failing to create a vision of to what the change initiative is leading to. The vision could mean the big picture goal of the change in this context.
4	Undercommunicating the vision	Not communicating enough about the change and its goals. Not being consistent with words and actions. Failing to make the employees believe in the change.
5	Permitting obstacles to block the new vision	Allowing any obstacles, such as inconsistent behavior of managers, compensation systems, organizational structure etc. to block the change effort.
6	Failing to create short-term wins	Not creating short term success, and waiting for the end result, which may occur after several years. Assuming that short term wins just occur, without proactive planning of the change process to include these short-term wins.
7	Declaring victory too soon	Declaring victory after the first successful event of the change, without enough if any evidence on that the original goals are met. Declaring victory before the change has strong roots in the organization.
8	Neglecting to anchor changes firmly in the corporate culture	Not assuring that the new ways of working are deeply rooted into the organization's social norms and culture. Not showing employees how specific behaviors have affected the performance. Ignoring the cultural aspect of change.

The eight common mistakes defined by Kotter are described on the right-hand side of the table. According to Kotter, making any of these mistakes can have profound consequences on the change initiative, and can cause a situation where the change objectives are not met. These common mistakes can be complemented by the ones Anderson & Anderson (2010a) suggest, since they comprise a more practical and detailed approach to common mistakes in leading change.

Appendix 11: Common mistakes in leading change (by Anderson & Anderson, 2010b)

Common mistakes in leading change defined by Anderson & Anderson (2010a, p. 20) with explanations derived from Anderson & Anderson (2010b, pp. 2-12) are shown in the table below.

#	Common mistakes	Explanation
1	Relevance and meaning	Not making the employees and management believe in and commit to the change initiative by demonstrating the relevance and meaning of the change. The relevance and meaning does include the linkage to strategy and market.
2	Change governance	Neglecting proper governance, such as providing sufficient authority to make decisions. The governance includes practical issues such as roles, structures, guidelines communication and meetings etc.
3	Strategic discipline for change	Not providing oversight, methodology, tools, and infrastructure to facilitate the change. Includes common agenda and methodology.
4	Misdiagnosing the scope	Focusing only on strategy, systems, structure, processes, job functions and competences, without considering the human realities such as behavior, mindsets, culture and emotional reactions.
5	Initiative alignment and integration	Not unifying multiple separate or competing, but related change initiatives. Not linking the related initiatives to the business vision and strategy.
6	Capacity	Not recognizing and providing sufficient capacity for the change initiative, and loading the employees with additional tasks on the top of their existing workloads. Setting unrealistic timelines.
7	Culture	Not recognizing the need of addressing the culture, or not committing to shift the culture to support the change and the new state that the change brings.
8	Leadership and modeling	Not leading by example. Not modelling the change as leaders, and not assessing their current mindsets, behaviors and styles. Behaving inconsistently with the requirements that the change sets to the employees of the organization.
9	Human dynamics	Not addressing the human dynamics of change and not designing the actions to minimize negative emotional reactions. Failing to build strategies that minimizes the negative emotional reactions.
10	Engagement and communications	Neglecting the possibility to gather input and opinions from the employees. Communicating the change in an one-sided manner, and not communicating the change in a two-way and face-to-face manner with the employees.

Avoiding making these mistakes suggested by Kotter and Anderson & Anderson, could probably improve the chance of success while leading a change initiative. Although, it is considerably difficult to avoid making all these mistakes, but acknowledging them and their effects could help to mitigate them to some extent.

Appendix 12: Findings related to the process manager role implementation

The main concerns of the process managers were clearly related to their possibility to allocate time for managing the processes. The reasons for the challenges to implement the processes and the process manager roles have deep underlying causes that came up in the interviews. As the SACM process manager stated:

> There is not enough time. The daily work is a mess currently, and there is simply no time to implement and manage the processes. Prioritization of the work (also by the management) causes that internal development comes last. (Data 2, Interview 1)

Similar concerns came up in the interviews of the two other process managers. Also, it was suspected that the lack of proper usage of the service request fulfilment process causes a treadmill that makes it even more difficult to develop and manage the processes, since new "fires" occur all the time, and the inefficient and undefined or unimplemented request fulfilment process hinders all the process managers to work efficiently and to have the possibility to develop internal issues. (Data 2, Interview 2). The process managers are all part of the Solution Advisory team (SA), that supports the cloud team and the consultants regarding new implementation projects and operation of existing customer environments, and the SA related work takes all their time (Data 2, Interview 1, 2, 3).

The process managers implied in the interviews, that the processes [service request fulfilment, change management, SACM] should be effectively implemented and the organization should support working according to the processes, and commit to the principles set by the processes. The concern of the organization's and management's commitment to the processes came up in the interviews 1 and 2:

> To implement the process manager roles, the management must commit completely (Data 2, Interview 1).

> The organization should commit completely to the new processes and roles, and provide sufficient authority and resources for the process managers (Data 2, Interview 2).

> Support by management would be required, and allocation of the implementation to different teams should be considered (Data 2, Interview 3).

These concerns are related to that new emerging tasks are constantly raised up by the implementation projects and the operations, and with insufficient authority to assign specialists to work on the issues, the scheduling and planning of request fulfilment becomes difficult. (Data 2, Interview 2) This concerns also the internal development and management of the processes.

In addition to commitment of the organization, the process managers pointed out (when they were asked which authorities they need) that they would need to have proper authority to allocate resources to different tasks, such as fulfilling requests and solving IT-problems:

> Real authority to resource employees to certain work, so that the organization supports it (Data 2, Interview 2).

> Authority to develop the process and allocate resources when needed. Authority to allocate persons from other stakeholder groups, for example from the product managers teams (Data 2, Interview 3).

Another main issue that came up in the Interview 1 of Data 2 was that other unfinished processes makes it challenging to implement one certain process, since the processes are considerably interrelated.

A summary of the interview results can be found in appendix 13.

Appendix 13: Summary of stakeholder input for the process manager role implementation

#	Question	SACM manager	Service request manager	Problem Manager
1	How could the roles be implemented in the best possible manner?	Reserving of time for work related to the role. Time should be allocated to the process manager duty. Is the management really committed? Someone's escalation to management can cause challenges, if the management is not actually committed. To implement the process manager roles, the management must commit completely.	Allocating resources or time to the work. It would also require time from the people that are supposed to use the processes. It's not enough that only the process manager who is supposed to oversee the process in the only one what has time. Often processes are planned, but the implementation lacks or is insufficient	Support by management would be required, and allocation of the implementation to different teams should be considered. The process managers should understand also the other process manager's roles. Cooperation between the process managers would be important, including planning and testing of the processes.
2	What are the challenges?	There is not enough time. The daily work is a mess currently, and there is simply no time to implement the processes. Prioritization (also from the management) causes that internal development comes last and therefore it seems that the management should commit better.	The challenge is that at the same time the process managers are supposed to do productive work. At the same time delivering customer work is impossible. Scheduling of work is impossible, since "new fires" occurs always. Real authority to allocate is missing, since the organization does not. Information flow regarding resourcing is not. Prioritization is not working, since people are doing "more fun" things, and according by real prioritization.	The implementation of the roles and/or processes are done as one-time-only. There's no time for planning/implementation. The tools exist, but they do not support the processes completely.
3	What should be done about the challenges?	Is there enough workforce? Creating understanding for the management, that processes should actually be followed.	The organization should commit completely to the new processes and roles, and provide sufficient authority and resources for the process managers.	Working and cooperation with other process managers should be made possible by allocating time.

4	How much work time should be allocated for the process manager role?	Difficult or impossible to estimate. The management's commitment is also related to this issue. Too many factors influence this matter.	-	More time in the beginning, since the processes must be transferred from paper to practice. The needed time can be estimated easier when the processes are in place. If the work time allocation is over 50%, it should be considered as the person's main job.
5	What should the responsibilities be?	For the SACM process, the responsibilities should be according to the RACI (in the process document).	Overseeing the process for SA and SD regarding service request.	Responsibility of process development and maintenance. Responsibility of problem coordination, resourcing, lifecycle and communication.
6	What authorities should the process manager have?	This relates to a lot of issues, since other processes must be in place. The suggested authorities are ok.	Real authority to resource employees to certain work, so that the organization supports it.	Authority to develop the process and allocate resources when needed. Authority to allocate persons from other stakeholder groups, for example from the product managers teams.
7	What issues should be discussed in the continuous process manager meetings?	The suggested issues are ok. No other things come to mind at the moment.	As per the suggestion: KPIs, challenges, trend-analysis of the amount of service requests. Request statistics would be good to have in general, currently there's no statistics of the datacard's handling.	-

Appendix 14: Tool for translating capacity requirements to capacity specifications

ESM Capacity planner

Parameters (1) that can be defined before project phase

Parameters that affect mainly CPU, RAM and STORAGE			
1.1 WRITE Licenses (max amount of concurrent users)	Weight	Put x below	Score
<10	2		
<100	4	x	4
<200	6		
<500	8		
1.2 READ Licenses (max amount of concurrent users)	Weight		
<10	1		
<100	2		
<200	3	x	3
<500	4		
1.3 Type of solution	Weight		
ITSM baseline	2		
Lightly customized ITSM	4		
Heavily customized ITSM	6		
Extended service management solution	8	x	8
1.4 Volume of tickets or datacards/month	Weight		
<100	1		
<300	2		
<500	3		
<1000	4	x	4

TOTAL for Parameters 1 19

Parameters (2) that can be defined during the project phase

Parameters that affect mainly STORAGE			
2.1 Attachments (% of tickets that have attachments)	Weight	Put x below	Score
No attachments	1		
<25% of tickets	2		
<50% of tickets	3	x	3
>75% of tickets	4		

Parameters that affect mainly CPU and RAM			
2.2 Integrations	Weight		
< 2	1		
< 4	2	x	2
< 6	6		
< 8	8		
2.3 Imports	Weight		
<5	1		
<10	2		
<15	6	x	6
<20	8		
2.4 Number of roles	Weight		
<5	1		
<20	2		
<50	3	x	3
<100	4		
2.5 Elevated user permissions (EUP)	Weight		
Not in use	0		
Few and simple	2		
Many (about 10 or more) or complex EUPs	4	x	4

TOTAL for Parameters 2 15

GRAND TOTAL 34

Table for estimating capacity requirements

Score	CPUs	RAM (GB)	STORAGE (GB)
< 12	4	12	200
< 22	6	16	250
< 32	8	24	300
< 42	10	32	500
< 52	12	64	1000

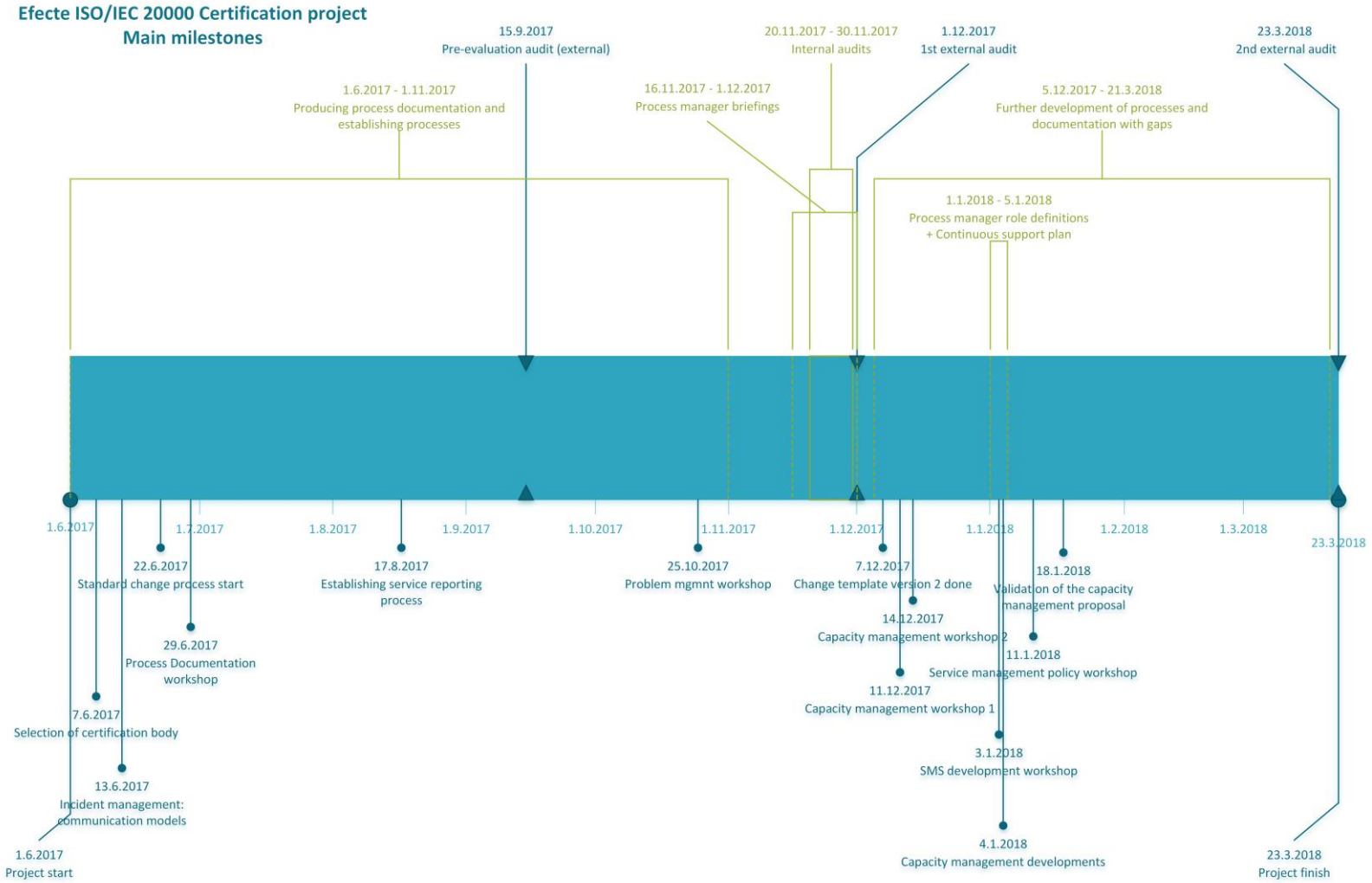
If the score exceeds 52, allocate an appropriate amount of capacity.

Table for estimating disk space requirements (GB)

Tickets and attachments/month (documents or pictures, 1/ticket)

	Attachments			
Tickets	None	<25% of tickets	<50% of tickets	>75% of tickets
<100	200	250	300	500
<300	250	300	500	750
<500	300	500	750	1000
<1000	500	750	1000	1500

Appendix 15: Timeline and main milestones of ISO20000 Certification and Development project



Appendix 16: Roles and responsibilities on process level from the final proposal

Process	Incident manager	Problem manager	Request manager	Change manager	Configuration manager	Inf. security manager	Solution Advisory	Service Desk	Cloud Operations	Director of Support	Director of Operations	VP of Services	Efecte Sales	Efecte Products	Efecte Fina	Efecte Management team
Incident management	A/R	I/C	C	I	C	C	C	R	C	C	C	I	I	C	I	
Problem management	C	A/R		C	C	C	R/C	C	C	C	C	I	I	C		
Service request fulfillment	C		A/R	C	C	C	R/C	R/C	R/C	C	C	I	I		C	
Change management	C	C	C	A/R	C	C	R/C	R/C	R/C	C	C	I	I	C	C	
Release and deployment management				R/A	I	C	C	C	C		C	I		C		
Service level management	C	C	C	C	C			C		R	R	A	C	I		
Capacity management		C/I			C		C	C	R	I	R/A	C		C	I	
Service asset configuration management					R		R	R	R	R	A/R					
Design and transition of new or changed services				C			C/I	C/I	R	R	R	R/A		R		
Continuity and availability management	C					C			R	R	R/A			C		C/I
Budgeting and accounting of services										R	R	R/A			R	C/I
Business relationship management							R	R		R	R	R	R/A			R
Supplier management								R	C	R	R	A			C	I
Service reporting	R	R	R	R	R	R		R		R	R	A				
Information security management	C	C				R			C		C	A		C		I